

# Some things never change

*Never trust a dog to watch your food.*

—Patrick, age 10

Our country has witnessed sweeping changes—from the untamed wild times of Buffalo Bill to the technological era of Bill Gates—but food has never lost its central role in our lives. Food not only sustains life but also enriches us in many ways. It warms us on cold, dreary days, entices us with its many aromas, and provides endless variety to the everyday world. Food is also woven into the fabric of our Nation, our culture, our institutions, and our families. Food is on the scene when we celebrate and when we mourn. We use it for camaraderie, as a gift, and as a reward (and sometimes as a crutch).

We are all aware of how food has changed. At the turn of the 20<sup>th</sup> century, home cooking and canning were fixtures of life in America. Lard, seasonal vegetables, potatoes, and fresh meats were the staples of our diet. And 40 percent of Americans lived on farms. Today, convenience foods and dining out are common. Ethnic diversity has influenced our tastes and the variety of foods available. Technology and trade allow us to enjoy most foods all year round. And only 1 percent of the population grows our food, while 9 percent are involved in the food system in some way—in processing, wholesaling, retailing, service, marketing, and inspection.

What Americans often forget, however, is the remarkable system that delivers to us the most abundant, reasonably priced, and safest food in the world. The American food system—from the farmer to the consumer—is a series of interconnected parts. The farmer produces the food, the processors work their magic, and the wholesalers and retailers deliver the products to consumers, whose choices send market signals back through the system. Every piece fits every other piece, notwithstanding an occasional gap and pinch. Our mission at the Economic Research Service (ERS) is to understand this system and effectively communicate our findings to the players in the system.

Some of those gaps and pinches currently receiving ERS scrutiny include obesity and food choices, the need for better targeting of food assistance benefits, as well as the environmental impacts of agriculture. The challenges of biotech foods and of emerging global markets and competitors (including Brazil, China, and Ukraine) are also among the issues analyzed by ERS.

At the end of the day, it is safe to say the U.S. food system has done a remarkable job of using technology and inventiveness to its advantage and ultimately to the benefit of the consumer. We get the foods we want, when we want them, in the form we want them, all at affordable prices. Thanks to this system, Americans spend less of their income on food than do consumers anywhere else in the world.

Despite the dramatic evolution of the American food system, there are some constants in our ever-changing world. Americans will always love food. The American food system will continue to adapt, grow, and provide us with the products we desire. And yes, that timeless advice stands: Never trust a dog to watch your food.

*James Blaylock*

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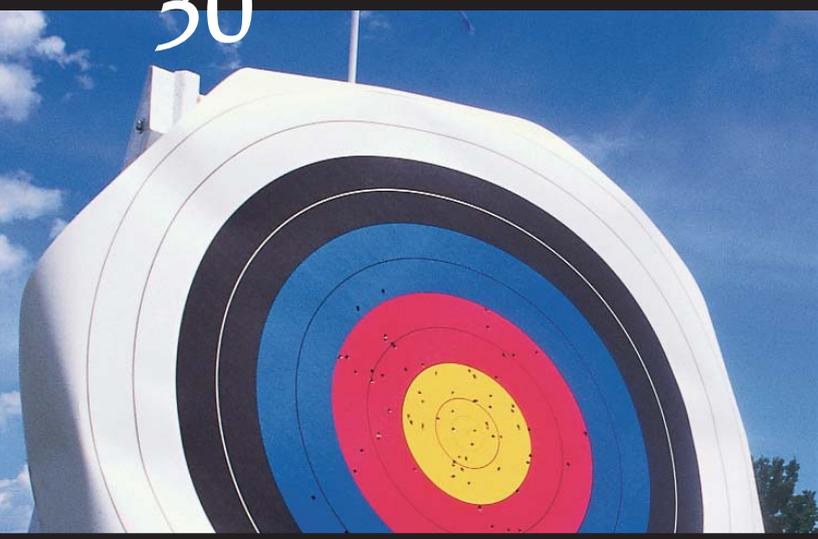
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# Nontraditional Exporters Increase Role in Wheat Markets

The EU continues to be a large wheat exporter. Historically, EU wheat production and exports depended on large subsidies. Despite lower domestic wheat prices, EU wheat production has grown because of favorable net returns compared with those for other crops. Lower prices have increased the domestic feed use of wheat, limiting exports.

The U.S. is expected to remain the world's largest wheat exporter, though its share will likely decline if U.S. producers continue to turn to other crops and if other countries find wheat profitable. As export shares shift, changes in U.S. supply will not affect prices as much as in the past. For example, when the U.S., Canada, and Australia suffered from drought in 2002/03, nontraditional exporters and the EU were able to export enough to keep a lid on prices. **W**

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**This finding is drawn from . . .**

*Wheat Yearbook*, 03.27.03, available at: [www.ers.usda.gov/publications/so/view.asp?f=field/whs-bby](http://www.ers.usda.gov/publications/so/view.asp?f=field/whs-bby)

ERS Wheat Briefing Room, at [www.ers.usda.gov/Briefing/Wheat](http://www.ers.usda.gov/Briefing/Wheat)

exports surged in 2001/02 and 2002/03 as increasing world prices generated the investment needed to expand port capacity. In 2002/03, Russia is expected to be the world's third largest wheat exporter, behind the U.S. and the European Union (EU).

India, Pakistan, and China have also become net exporters of wheat in recent years. High government production supports during the 1990s boosted production and stocks. When the cost of maintaining these stocks became burdensome, exports increased, particularly as prices increased in 2002/03. However, these opportunistic exports are not expected to persist because these countries are unable to produce wheat cheaply enough to sustain increased exports without large subsidies.

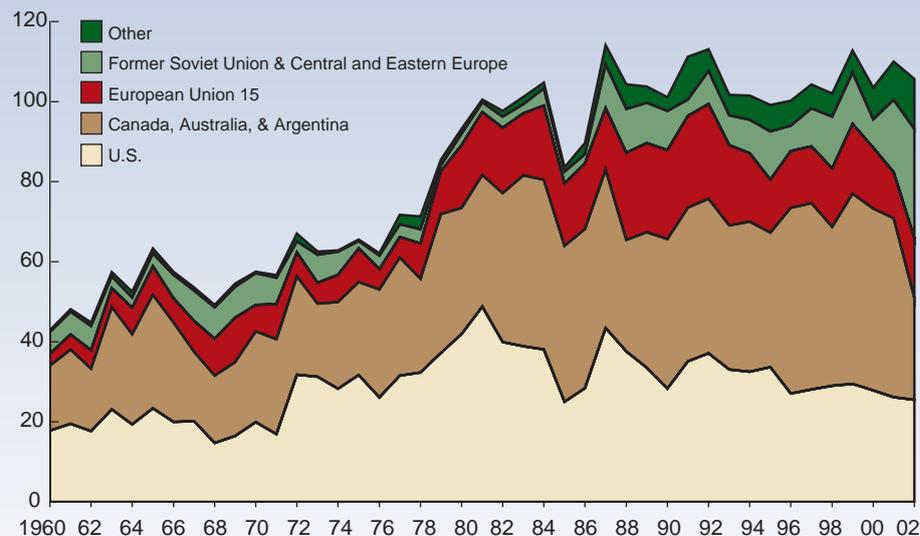
Though the volume of world wheat trade has changed little in the past 15 years, shares of trade volume in exporting countries have changed quite a bit. The U.S. remains the largest exporter, but U.S. farmers are increasingly producing other crops, like corn and soybeans, so the U.S. share of the wheat market has fallen from 40 percent in the 1970s to 23 percent (forecast) for 2002/03. This shift in U.S. agricultural production, combined with rising prices caused by drought in three of the largest exporters—U.S., Australia, and Canada—has created opportunities for “nontraditional” wheat exporters.

With their favorable climates and large land bases, the former Soviet Union (FSU) and Central and Eastern Europe are traditional places for wheat production. Reductions in agricultural subsidies during the 1990s, however, caused a sharp drop in livestock production, which, in turn, curtailed domestic demand for wheat as an animal feed. While wheat output also fell, recent large harvests, caused largely by favorable weather, have supported wheat exports. FSU wheat

Photo by Tim McCabe, USDA/NRCS

## U.S. share of world wheat market is declining

Exports, million metric tons

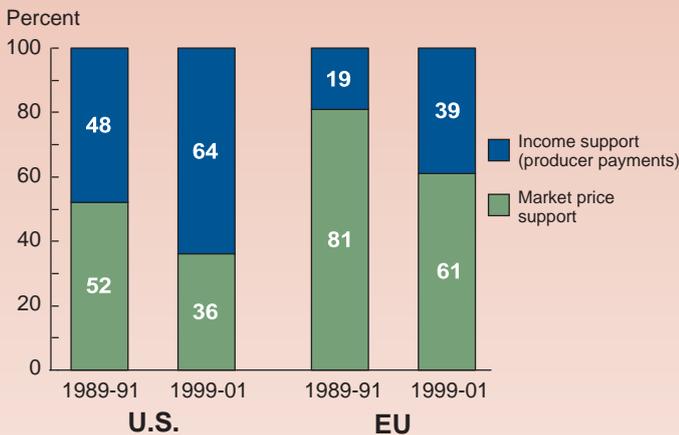


Source: USDA Production, Supply, and Distribution database.

# Are U.S. and European Union Agricultural Policies Becoming More Similar?

Throughout much of the post-World War II period, agricultural policy in the U.S. and European Union (EU) has focused on supporting farm income primarily through price supports. Both countries supported commodity prices through purchase and storage of surplus commodities. The U.S. relied more on producer loans secured by commodities and acreage controls, while the EU relied more on export subsidies to dispose of surpluses. Both the U.S. and the EU have significantly changed their commodity policies in the past decade. While their policies have evolved in similar directions in some respects, important differences remain.

## U.S. and EU shift toward income support



Source: Producer support estimates, as reported in *Agricultural Policies in OECD Countries: Monitoring and Evaluation, 2002*, Organization for Economic Cooperation and Development.

Both the U.S. and the EU have reduced their reliance on price support for several commodities for the same reasons: to improve their competitiveness, reduce burdensome stocks associated with high support prices, and rein in rising costs of operating commodity programs. Both countries now make greater use of income support through payments to producers.

Lower support prices and government purchases have reduced the need for surplus disposal, including export subsidies. Since 1995, U.S. use of export subsidies has been limited essentially to dairy products and poultry. The EU continues to use export subsidies for many price-supported commodities, although World Trade Organization (WTO) obligations have required the EU to reduce subsidy levels.

Despite similarities in policy changes, EU and U.S. policies differ. The EU maintains a higher overall support level to its farm sector and relies more on price support than does the United States. Although some EU support prices have been

reduced, higher tariffs contribute to market price support by preventing the entry of lower priced imports.

Both U.S. and EU agricultural policies will continue to respond to domestic needs, the international environment, and obligations under trade agreements. In addition, public pressure on broader issues, including environmental protection,

rural development, and food safety, is increasingly shaping agricultural policy.  $\forall$

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**This finding is drawn from . . .**

ERS Briefing Room on Farm and Commodity Policy: [www.ers.usda.gov/Briefing/FarmPolicy](http://www.ers.usda.gov/Briefing/FarmPolicy)

ERS Briefing Room on the European Union: [www.ers.usda.gov/Briefing/EuropeanUnion](http://www.ers.usda.gov/Briefing/EuropeanUnion)



# Information Sways Consumer Attitudes Toward Biotech Foods

Scientists use modern biotechnology (biochemical manipulation of genes or DNA) to develop new varieties of foods and agricultural products, commonly called biotech foods. Large shares of common crops, such as corn and soybeans, are grown from bioengineered seed. Many processed foods on U.S. supermarket shelves contain biotech ingredients.

Labeling of biotech foods has been a contentious issue in the U.S. and between the U.S. and its trading partners. Proponents of mandatory biotech food labeling argue that consumers have a right to know how their food has been produced. Opponents argue that such labeling will confuse and, in many cases, unnecessarily alarm consumers. In the U.S., when biotechnology introduces a known allergen or substantially changes a food's nutritional content or composition, Federal regulations require that the label indicate this change. So far, no biotech foods on the market have required labeling.

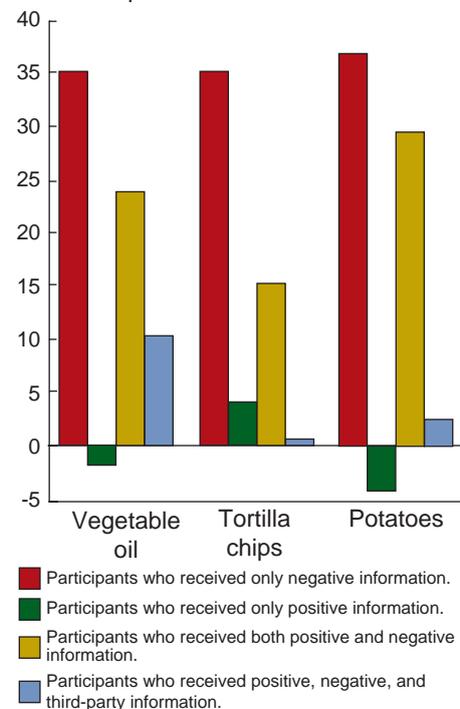
In 2001, ERS and university researchers held experimental auctions to gauge consumers' willingness to pay for food items with and without biotech labels. In the absence of sales data, experimental auctions more closely simulate purchasing behavior and better gauge consumer preferences than surveys of consumer attitudes. Auction participants could bid on and purchase three different food products—potatoes, vegetable oil,

and corn tortilla chips—with and without a label indicating that the food contained biotech ingredients. None of the foods had biotech-enhanced attributes or traits that could be detected without sophisticated testing technologies, if at all.

Before the bidding, each participant received one of six information packets containing statements about biotechnology gathered from a variety of sources.

## Consumers' reactions to biotech-labeled foods depend on the information they receive

Percent of price discount



Information played a powerful role in shaping how the participants responded to biotech foods. They reacted not just to the information itself, but also to whether the information came from biotech firms, an environmental advocacy group, or independent third-party sources.

Participants who received only pro-biotech information actually put a slight average premium of 2 percent on the biotech-labeled foods relative to foods without biotech labels for two of the three products. Participants who received only anti-biotech information discounted the biotech-labeled foods by an average of 36 percent. Those who received both pro- and anti-biotech information discounted the biotech-labeled foods by an average of 23 percent. Interestingly, participants placed a greater weight on negative information than on positive information, a result consistent with other studies. The ERS study also looked at the role of science-based information on consumer attitudes towards biotech foods. *W*

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### This finding is drawn from . . .

*The Effect of Information on Consumer Demand for Biotech Foods: Evidence from Experimental Auctions*, by Abebayehu Tegene, Wallace Huffman, Matt Rousu, and Jason Shogren, TB-1903, March 2003, available at: [www.ers.usda.gov/publications/tb1903](http://www.ers.usda.gov/publications/tb1903)

## U.S. Hog and Poultry Marketing: Similar Paths, Similar Outcomes?

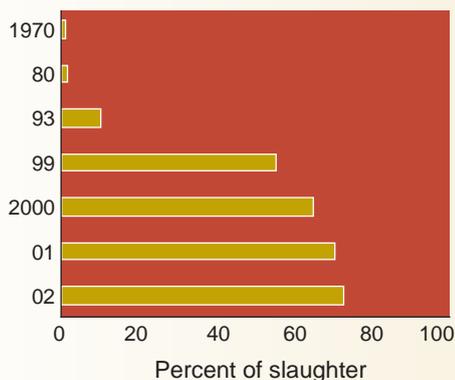
Recent changes in the structure of the pork industry echo past changes in the poultry industry.

How U.S. pork producers and processors sell and buy hogs has changed significantly since 1990. The use of long-term contracts has largely replaced production for the open, or spot, market. Over 70 percent of hogs are sold under contracts, where producers are required to deliver a specified number of hogs to the processor at a specified time. In return, the producer receives the spot price, adjusted for the size and quality of the hogs.

These developments raise concerns by some about anticompetitive behavior of large processors and the demise of small, independent farmers. Others emphasize how contracts facilitate steady flows of high-quality farm products for processing, among other benefits.

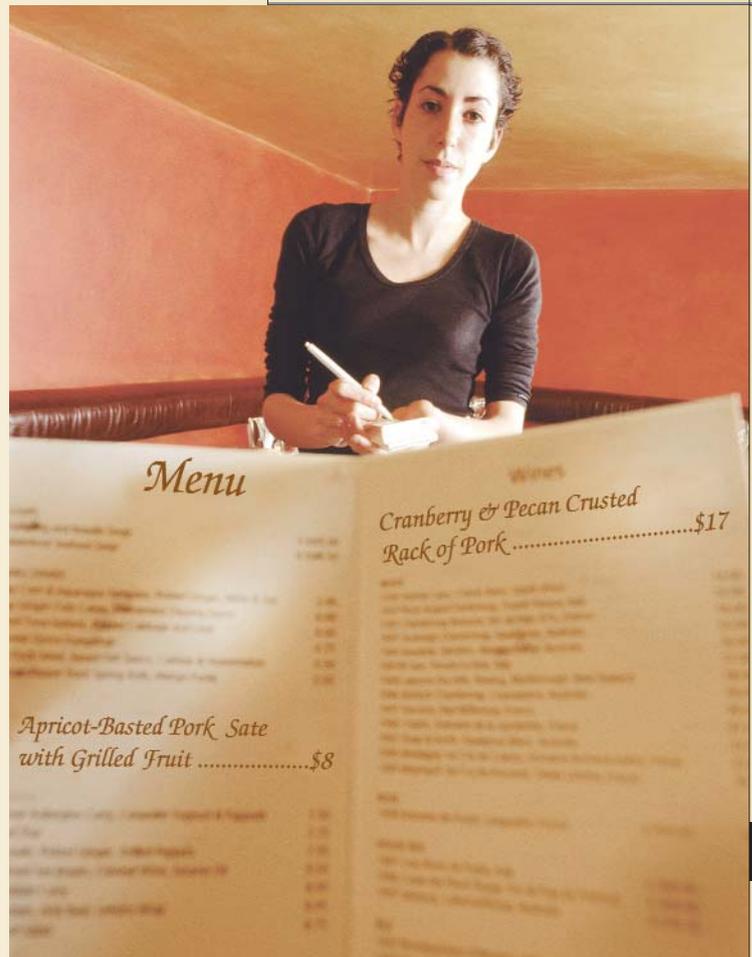
In the U.S. poultry industry, contracts and common ownership of production and processing (called "vertical integration") expanded in the 1950s. By 1977, contracts and vertical integration accounted for over 85 percent of broiler, turkey, and egg production. Today, these arrangements account for over 90 percent of production in each of the three sectors. At the same time, the poultry industry significantly improved production efficiencies. It also capitalized on consumers' interest in lower fat sources of protein and responded to their quest for convenience with a wide variety of processed, branded poultry products. These developments were reflected in large supplies of poultry products that were priced low relative to other meats.

### Contracts dominate the share of hogs delivered to processors



more than doubled, and the number of pork mentions on menus exceeded all other meats in 1999, except for chicken, according to a study by the National Pork Producers Council.

The pork industry has also improved production efficiency. Offspring from a typical breeding hog produced 30 percent more pork in 1999 than in 1990. The industry is offering more lean, further-processed, case-ready products. From 1995 to 1999, the number of new pork items on foodservice menus



Corbis

These efficiencies and expanded product offerings have led to larger pork supplies that have lowered pork prices and may have tempered declines in demand dating back to the 1970s. From 1990 to 2002, pork production increased by 2 percent per year, and deflated retail pork prices fell by 1 percent per year. From 1980 to 1995, the demand for pork fell by 34 percent. Since 1995, the demand for pork has increased by 8 percent.

The pork industry is also following the lead of poultry in export markets. The U.S. poultry industry has experienced considerable growth in exports, as indicated by its status as the world's largest exporter of poultry meat. Similarly, reliable supplies tailored to customer specifications have helped boost U.S. pork exports fivefold in the 1990s. *W*

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#### This finding is drawn from . . .

*Vertical Coordination of Marketing Systems: Lessons From the Poultry, Egg, and Pork Industries*, by Steve W. Martinez, AER-807, April 2002, available at: [www.ers.usda.gov/publications/aer807](http://www.ers.usda.gov/publications/aer807) and from *Vertical Coordination in the Pork and Broiler Industries: Implications for Pork and Chicken Products*, by Steve W. Martinez, AER-777, April 1999, available at: [www.ers.usda.gov/publications/aer777](http://www.ers.usda.gov/publications/aer777)



Photo by Ken Hammond, USDA

## Manure Management: A Growing Challenge in the Chesapeake Bay Watershed

Farmers who run confined animal feeding operations (hog, cattle, dairy, and poultry farms) usually dispose of manure by spreading it on cropland as a soil amendment and source of nutrients. Because manure is expensive to transport, producers may apply more than crops can use, especially on fields nearest the production facility. Excessive manure applications increase the potential for contamination of surface and ground water. To address water quality concerns, USDA and the U.S. Environmental Protection Agency (EPA) together developed a strategy for improving manure management. A primary emphasis of the joint strategy is to limit application of manure nutrients to rates that the soil can store and crops can use. USDA will provide technical and financial assistance to help operators develop and implement comprehensive nutrient management plans (CNMPs). EPA published regulations in February 2003 that will require over 15,000 concentrated animal feeding operations to implement CNMPs. This emphasis on manure management presents a new challenge to large livestock and poultry operations, particularly in areas with relatively high animal concentrations such as the Chesapeake Bay watershed, which covers parts of Maryland, Virginia, West Virginia, Delaware, Pennsylvania, and New York.

Recent ERS analysis indicates that better manure management will likely require manure to be applied to more land than currently, raising hauling costs for many animal producers. An operator's need to access additional land for manure application will depend on the volume of manure for disposal relative to cropland area currently receiving manure and the nutrient uptake of the crops. The willingness of crop farmers to accept manure on their land—considering manure's variable nutrient content, potential odor, and handling cost—affects the amount of land available for manure application and the distance manure must be hauled. A low willingness by crop producers to accept manure may cause some manure to be hauled long distances to access sufficient land to avoid overapplication of manure nutrients.

As part of the ERS study, analysts examined the feasibility and cost of applying manure in the Chesapeake Bay watershed at rates not exceeding crop uptake. For all the nitrogen in manure to be used by crops within 100 miles of the manure's origin, crop farmers in the region would have to accept manure as the only nitrogen fertilizer source on at least 20 percent of total cropland. Under a more stringent standard, where applied manure does not exceed crop phosphorus needs, crop farmers within a 100-mile radius would have to accept manure as the only phosphorous source on at least 60 percent of the total cropland.

USDA financial and technical assistance in managing and utilizing the nutrients in manure could increase crop farmers' willingness to accept manure application on their land. Where hauling costs for manure land application are high, the ERS analysis indicates potential to reduce the amount of land receiving manure by expanding industrial processes that use manure to produce energy or commercial fertilizer products, and by feeding animal rations that lessen manure nutrient content.  $\mathcal{W}$

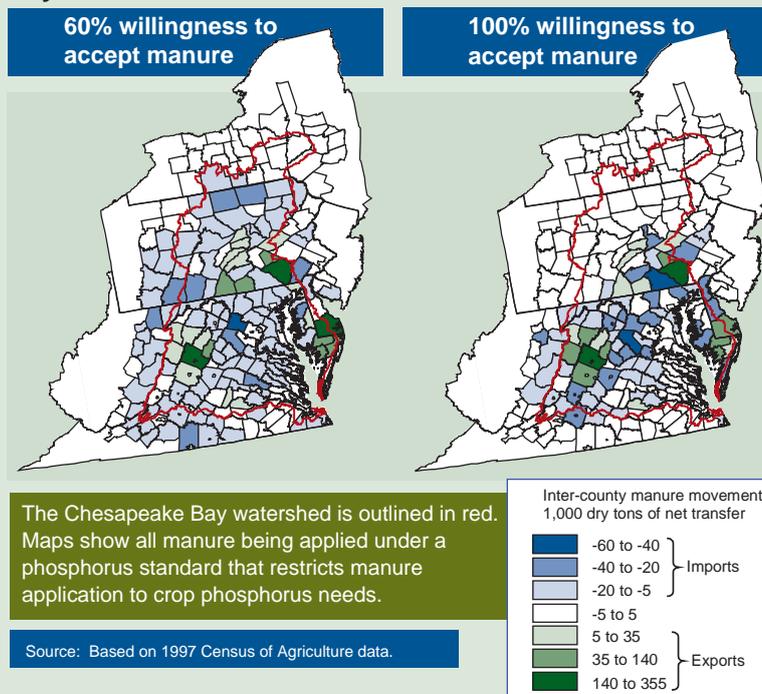
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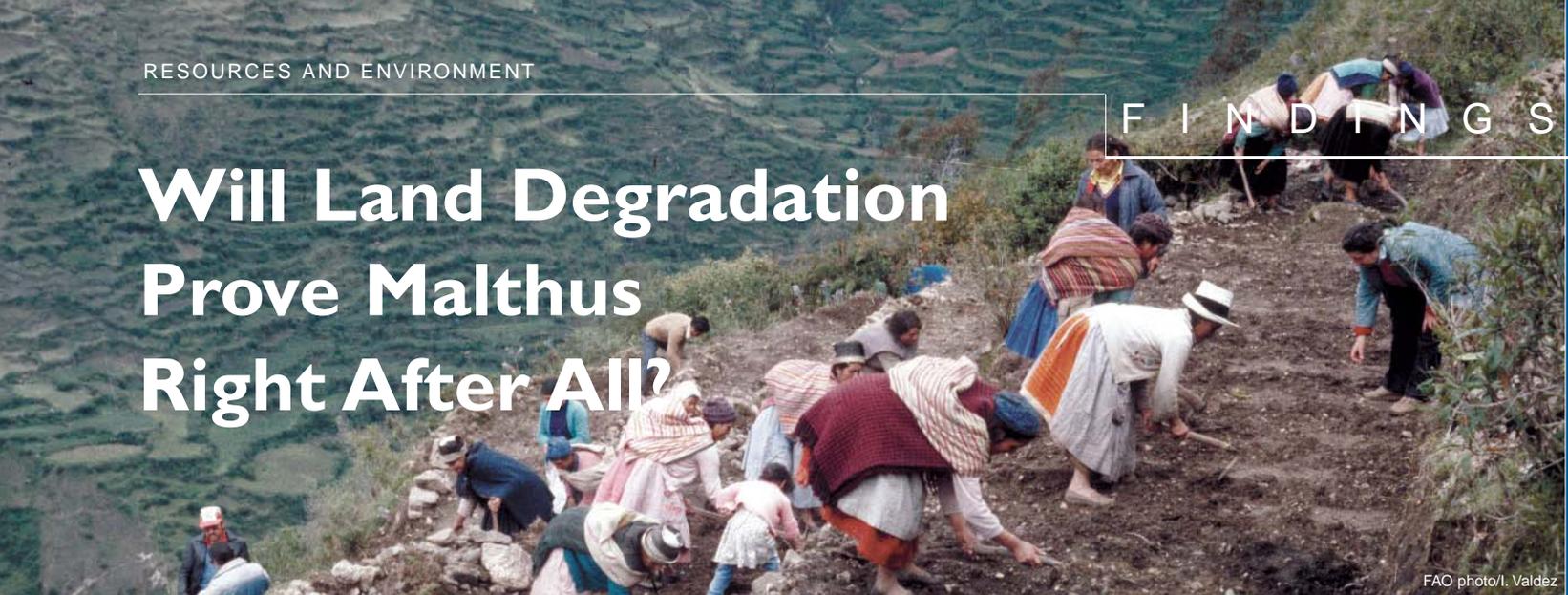
**This finding is drawn from . . .**

A broader ERS study of farm, regional, and national level implications of new animal waste regulations and guidelines: *Manure Management for Water Quality: Costs to Animal Feeding Operations of Applying Manure Nutrients to Land*, by M. Ribaud, N. Gollehon, M. Aillery, J. Kaplan, R. Johansson, J. Agapoff, L. Christensen, V. Breneman, and M. Peters, AER-824, USDA/ERS, June 2003, available at: [www.ers.usda.gov/publications/aer824](http://www.ers.usda.gov/publications/aer824)

### Higher willingness of crop farmers to accept manure would reduce out-of-county transport in the Chesapeake Bay watershed



# Will Land Degradation Prove Malthus Right After All?



FAO photo/I. Valdez

Two hundred years ago, citing concerns dating back to Plato and Aristotle, English clergyman and economist Thomas Malthus argued that population growth would inevitably outpace food production—unless checked by “moral restraint, vice, or misery.” In 1960, his concerns appeared well founded. Growing at an unprecedented rate, the world’s population reached 3 billion, and a third of those were undernourished.

For many of these people, secure and sustainable access to sufficient food for active, healthy lives—food security—depends on income from agriculture, and thus on the productivity of agricultural land and labor.

World-average cereal yields rose by more than 2 percent per year during the 1960s and 1970s, driven by the improved seed varieties and increased input use of the Green Revolution. However, yield growth has slowed since then and the Food and Agriculture Organization (FAO) projects that cereal yield growth will slow to a global average of 0.8 percent per year over the next three decades. Do soil erosion, soil fertility depletion, and other forms of land degradation threaten the productivity gains achieved in the past? Could Malthus be right after all?

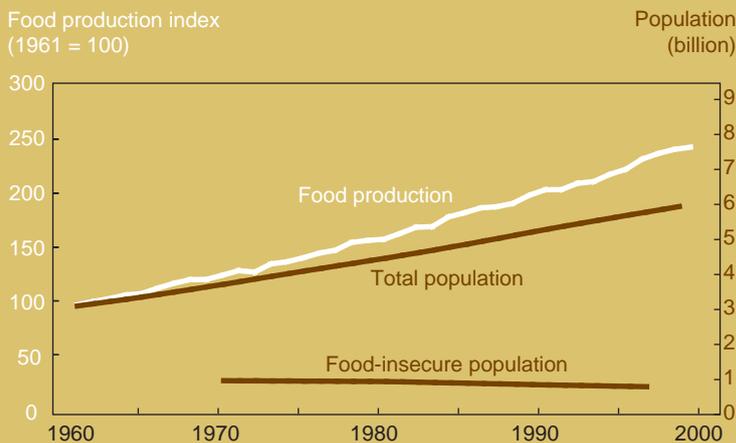
region, but average 0.3 percent per year worldwide when farmers’ practices are held constant. Given FAO’s projections of slower yield growth, further yield losses of this magnitude could reverse recent reductions in the number of people who are food insecure. However, farmers’ practices do change over time in response to changing conditions, so actual yield losses to land degradation are typically lower. For example, ERS analysis finds that yield losses to soil erosion in the North-Central U.S. are less than 0.1 percent per year when farmers choose management practices that are most profitable over the long term.

ERS research suggests that land degradation does not threaten food security at a global scale, but impacts vary by location. Yield losses due to land degradation do pose problems in areas where soils are shallow, fields are steeply sloped, property rights are insecure, and farmers have limited access to inputs, information, and markets. Any further slowing of yield growth in the future would increase the importance of measures to address these challenges. **W**

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**This finding is drawn from . . .**  
*Linking Land Quality, Agricultural Productivity, and Food Security*, by Keith Wiebe, AER-823, June 2003, available at: [www.ers.usda.gov/publications/aer823](http://www.ers.usda.gov/publications/aer823)

## World food production has increased faster than population, but food insecurity remains a challenge



Source: Based on FAO data.

Forty years later, the world’s population has doubled to 6 billion, but food production has grown even faster, and fewer people are undernourished. Rising food demand led to higher input use and improved technology and efficiency. Even so, more than 800 million people—mostly in Asia and Africa—remain undernour-

ished. Because relevant data are scarce, the extent to which yields have been reduced by land degradation has been difficult to determine. Recent analysis by ERS economists, in collaboration with soil scientists at USDA’s Natural Resources Conservation Service and Ohio State University, finds that yield losses to soil erosion vary widely by crop and

## Low-Skill Workers Are a Declining Share of All Rural Workers

Rural workers in jobs with low skill requirements declined as a share of all rural workers during the 1990s, a decade when technological change seemed to favor high-skill urban-oriented economic activities. The share of workers in low-skill jobs declined more in rural areas (2.2 percentage points) than in cities and suburbs (1.1 percentage point) in the 1990s. This trend suggests that rural workers as a whole are participating in the long-term national movement toward a more skill-intensive economy marked by higher labor productivity and wages. The low-skill workforce includes a majority of the rural working poor and near-poor population, who are the focus of recent Federal policy initiatives designed to ensure a sustainable wage. By 2000, 42 percent of rural America's 25 million workers were employed in jobs with low skill requirements (6 percentage points above the national average).

According to ERS research, the declining share of rural workers in low-skill jobs resulted from a shift in industrial employment from the goods-producing sector to the service sector. Mining and manufacturing, major forces in the goods sector, have historically

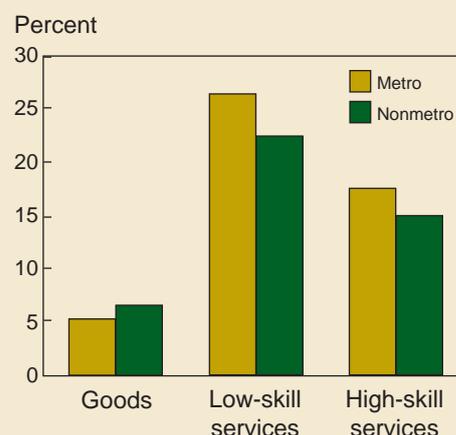
required a large number of workers with limited skills, but now employ a much smaller proportion of the rural workforce than in previous decades. On the other hand, service employment, with typically higher verbal and quantitative skill requirements, grew rapidly.

A shift *within* the service sector toward less-skilled jobs, however, offset the drop in goods-producing employment. Most of the recent decline in the low-skill share of rural employment is attributable to occupational shifts *within* industries, with the most pronounced shift in the goods sector. These shifts reflect a growing demand for workers engaged in high-skill activities, such as administration and research associated with corporate headquarters. Moreover, technological advances in the way that goods and services are produced favor workers who can perform more complex tasks and are more proficient in verbal and quantitative skills.

Other recent evidence corroborates the picture of skill upgrading in rural America. ERS research on rural and urban differences in computer use and the

adoption of advanced production technologies in manufacturing has found that technological skills are being upgraded at about the same rate in rural and urban establishments. Furthermore, educational attainment, which closely tracks skill measures, rose as quickly among rural adults as among urban adults in the 1990s. In some rural communities, the loss of low-skill jobs creates a hardship for workers lacking training opportunities or alternative employment.

### Employment growth by sector in metro and nonmetro areas, 1990-2000



But the growth in expertise and skills needed for a more technologically advanced economy should benefit the rural workforce overall. These trends are primarily evidenced by shifts in the employment mix within industries, rather than by the employment shifts between industries that often attract the most attention.  $\mathbb{X}$

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This finding is drawn from . . .  
[www.ers.usda.gov/Briefing/LaborAndEducation/lwemployment](http://www.ers.usda.gov/Briefing/LaborAndEducation/lwemployment)



Photo by Joe Valbuena, USDA



# The Dynamics of Hired Farm Labor

USDA photo

Since World War II, the number of farmworkers has significantly declined as technology has advanced. Yet, hired farmworkers as a share of the total agricultural workforce—which includes farm operators and unpaid workers—have increased since the 1940s and accounted, on average, for over one-third of agricultural employment in the 1990s, up from one-quarter in the 1950s.

Less than 1 percent of all U.S. wage and salary workers, hired farmworkers make a significant contribution to agricultural output, providing labor during critical production periods. Hired farmworkers include those who reported their primary employment as farm managers (10 percent), supervisors of farmworkers (5 percent), nursery workers (3 percent), and farmworkers engaged in planting, cultivating, and harvesting crops or tending to livestock (82 percent). The number of hired farmworkers varies significantly throughout the U.S. The West accounted for over 44 percent of all hired farmworkers in 2000, and the West and South together accounted for almost 75 percent of hired farmworkers. The Northeast had the smallest number of workers (7 percent). Over half of all hired farmworkers (460,000) were located in five States—California (30 percent), Texas (10 percent), Florida (6 percent), New York (4 percent), and North Carolina (3 percent).

In 2001, over 80 percent of hired farmworkers were male, nearly 46 percent Hispanic, and nearly 75 percent less than 45 years old. Over half had not finished 12 years of school, and over a third were not U.S. citizens. By contrast, slightly more than 50 percent of all wage and salary workers

were male in 2001, over 70 percent White, and over 60 percent younger than 45. More than half had 13 or more years of school, and more than 90 percent were U.S. citizens.

With median weekly earnings of \$345 in 2001, hired farmworkers are some of the lowest paid full-time workers in the U.S. Several factors contribute to their poor economic situation: low wages, seasonal employment, weak attachment to the labor force, and limited participation in the nonfarm labor market. Most receive few benefits and work long hours in jobs that are sometimes unsafe. Some farm labor experts suggest that as many as half of hired farmworkers are in this country illegally. Their ability to secure better jobs in agriculture or elsewhere in the economy is often hindered by immigration policy, cultural differences that may impede their integration into the broader society, lack of access to education and other training to enhance skills, and other barriers. Long-term concerns surrounding the farm workforce, such as low economic returns to work, poor working conditions, and occupational safety issues, have been further complicated by a greater reliance on immigrant labor. **W**

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**This finding is drawn from . . .**

ERS Briefing Room on Farm Labor: [www.ers.usda.gov/Briefing/FarmLabor/Employment](http://www.ers.usda.gov/Briefing/FarmLabor/Employment)

“Hired Farmworkers’ Earnings Increased in 2001 But Still Trail Most Occupations,” by Jack L. Runyan in *Rural America*, Vol. 17, No. 3, Fall 2002, available at: [www.ers.usda.gov/publications/ruralamerica/ra173](http://www.ers.usda.gov/publications/ruralamerica/ra173)

**Hired farmworkers rank near the bottom in earnings of major occupation groups**  
 Median weekly earnings of full-time workers, by occupation, 2001



Source: Calculated by ERS using data from the Current Population Survey of earnings.

# Trends in U.S. Per Capita Consumption

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Dairy products make important contributions to the American diet. They provide high-quality protein and are good sources of vitamins A, D, and B-12, and also riboflavin, phosphorus, magnesium, potassium, zinc, and calcium.

In 1909, Americans consumed a total of 34 gallons of fluid milk per person—27 gallons of whole milk and 7 gallons of milks lower in fat than whole milk, mostly buttermilk. Back then, buttermilk was the byproduct of churning milk or cream into butter, often done on farms. Today, the major byproduct of the commercial butter-making process is nonfat dry milk, and our buttermilk is cultured, or soured, by the addition of lactic acid or suitable bacteria to sweet milk. More than half (56 percent) of the milk consumed in 1909 was consumed on the farms where it was produced, compared with 10 percent in 1960 and 0.3 percent in 2001.

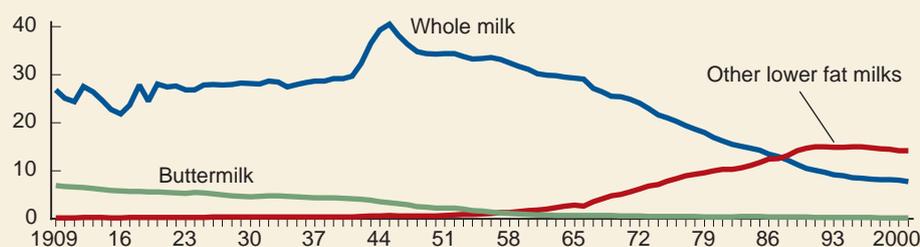
Significant improvements in milk production in the first half of the 20th century helped to control the spread of disease and enhance the nutritional value of milk. In the early 1900s, when diseases like typhoid fever and diphtheria were spread through the milk supply, public health authorities promoted pasteurization and other measures to eliminate disease-producing organisms from milk. In the 1930s and 1940s, fortification of milk with vitamin D was a critical step in the control of rickets, a vitamin D deficiency disease of children in which bones are softened or deformed. Homogenization prevented milkfat (cream) and fat-soluble vitamin D from rising to the top of the milk and being poured off for uses other than drinking and ensured that children obtained the nutrients they needed from drinking milk.

Fluid milk consumption shot up from 34 gallons per person in 1941 to a peak of 45 gallons per person in 1945. War production lifted Americans' incomes but curbed civilian production and the goods consumers could buy. Many food items were rationed, including meats, butter, and sugar. Milk was not rationed, and consumption soared. Since 1945, however, milk consumption has fallen steadily, reaching a record low of just under 23 gallons per person in 2001 (the latest year for which data are available). Steep declines in consumption of whole milk and buttermilk far outpaced an increase in other lower fat milks. By 2001, Americans were consuming less than 8 gallons per person of whole milk, compared with nearly 41 gallons in 1945 and 25 gallons in 1970. In contrast, per capita consumption of total lower fat milks was 15 gallons in 2001, up from 4 gallons in 1945 and 6 gallons in 1970. These changes are consistent with increased public concern about cholesterol, saturated fat, and calories. However, the decline in per capita consumption of fluid milk also may be attributed to competition from other beverages, especially carbonated soft drinks and bottled water, a smaller percentage of children and adolescents in the U.S., and a more ethnically diverse population whose diet does not normally include milk.



**Americans are switching to lower fat milks**

Gallons per person

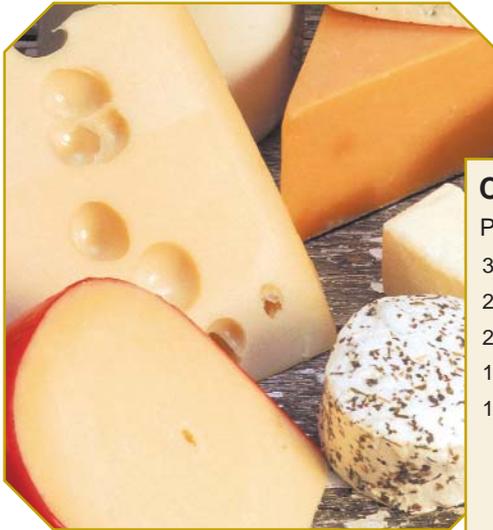


Lower fat milks include: buttermilk (1.5 percent fat), plain and flavored reduced fat milk (2 percent fat), low-fat milk (1 percent fat), nonfat milk, and yogurt made from these milks (except frozen yogurt).

ERS annually calculates the amount of dairy products and other food available for consumption in the U.S. This series provides data back to 1909 for many commodities and is the only continuous source of data on food and nutrient availability in the U.S. For more information, visit [www.ers.usda.gov/data/foodconsumption](http://www.ers.usda.gov/data/foodconsumption)

# of Dairy Products, 1909 to 2001

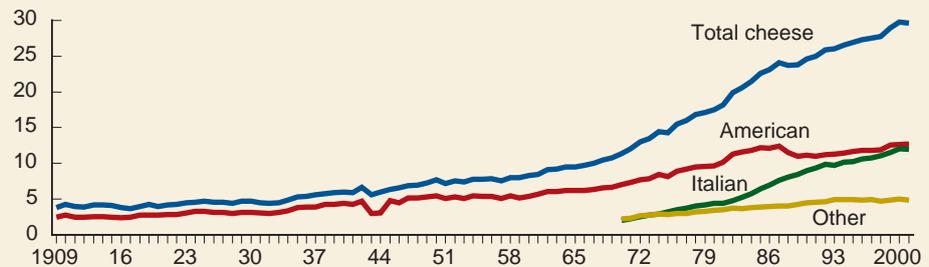
In 2001, Americans consumed 30 pounds of cheese per person, 8 times more than they did in 1909 and more than twice as much as they did in 1975. Demand for time-saving convenience foods is a major force behind this growth in cheese consumption. More than half (about 55 percent to 65 percent) of our cheese now comes in commercially manufactured and prepared foods (including for food service), such as fast food sandwiches and packaged snack foods. New products, such as resealable bags of shredded cheeses, have also raised consumption.



Comstock

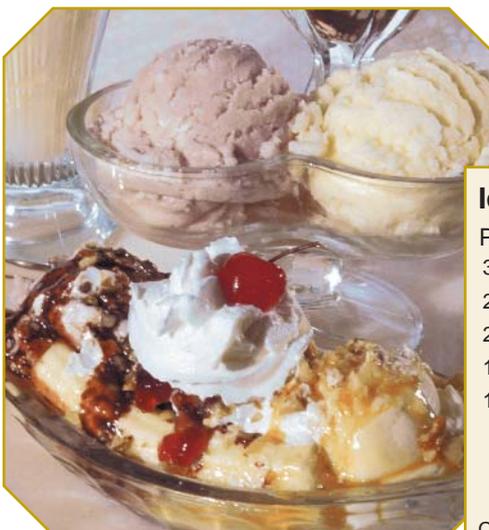
## Cheese consumption continues to rise

Pounds per person



American cheese includes Cheddar, Colby, Washed or Stirred Curd, Monterey, and Jack. Italian cheese includes Mozzarella, Ricotta, Provolone, Romano, Parmesan, and other Italian cheeses. Other natural cheese includes Swiss (including imports of Gruyere and Emmenthaler), Brick, Cream, Neufchatel, Blue, Gorgonzola, Edam, Gouda, and all others.

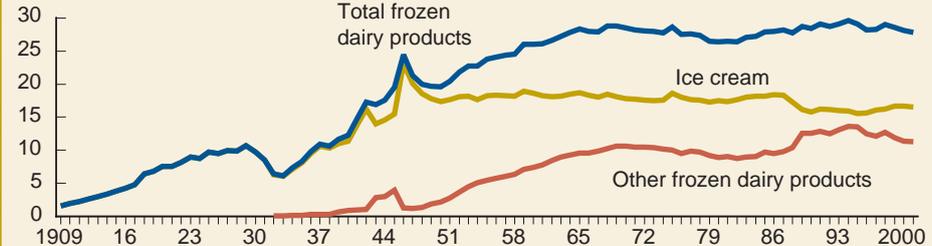
U.S. per capita consumption of ice cream reached an all-time high of 23 pounds (more than 20 quarts per person) in 1946 as America celebrated its World War II victory and sugar rationing was lifted. From 1949 through 1987, per capita ice cream consumption was relatively constant in the U.S. As more prepackaged ice cream was sold through supermarkets, traditional ice cream parlors and soda fountains started to disappear. Also during this period, average consumption of other frozen dairy products, such as sherbet and reduced-fat ice cream, increased. Since 1988, Americans, on average, have been eating a little less ice cream overall but more of the higher priced, higher milkfat premium and superpremium ice creams as well as frozen yogurt and other frozen dairy products.



Comstock

## Ice cream consumption peaked in 1946

Pounds per person



Other frozen dairy products include: reduced-fat ice cream, sherbet, frozen yogurt, and other frozen dairy products.

# China's Growing Affluence

VOLUME 1 • ISSUE 3

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AMBER WAVES

## How Food Markets Are Responding

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Photo by Fred Gale, USDA/ERS

The proliferation in China of restaurants, supermarkets, advertising, new products, and attractively packaged goods signals Chinese consumers' new, more prominent influence in their country's economy. The increased spending power and changing eating habits of China's 1.3 billion people are transforming the country's food sector, both domestically and in foreign trade. In the past decade, China's agricultural imports have diversified to include more meats, vegetables, seafood, processed foods, and

other consumer-oriented products, and China's rising consumption of edible oils has made it a \$2-billion-per-year importer of soybeans. Foreign firms are playing a leading role in China's fast-developing fast food and food retail sectors, and foreign products can now be found on the shelves of Chinese supermarkets. Farmers and agricultural- and food-related businesses that can keep up with the rapid pace of change will be the best prepared to make further inroads in the China market.

### Changing Food Landscape

The way Chinese people buy and consume foods has been transformed since of the early 1990s. Brightly lit supermarkets with computerized checkouts are staffed by crisply uniformed attendants. Numerous brands of rice and cooking oil packaged in attractive bags and plastic bottles vie for the attention of shoppers. Fast food and full-service restaurants and shopping mall food courts have proliferated, as

have foreign brand names on restaurant signs and supermarket shelves. Dimly lit government-run grain stores are a thing of the past, and ration coupons have been relegated to collector's items.

Open-air farmers' markets still offer city residents fresh vegetables, fruits, eggs, and meat, but these traditional food outlets, too, have changed: fewer market vendors sell produce they grow themselves. Instead, many vendors sell fruits and veg-

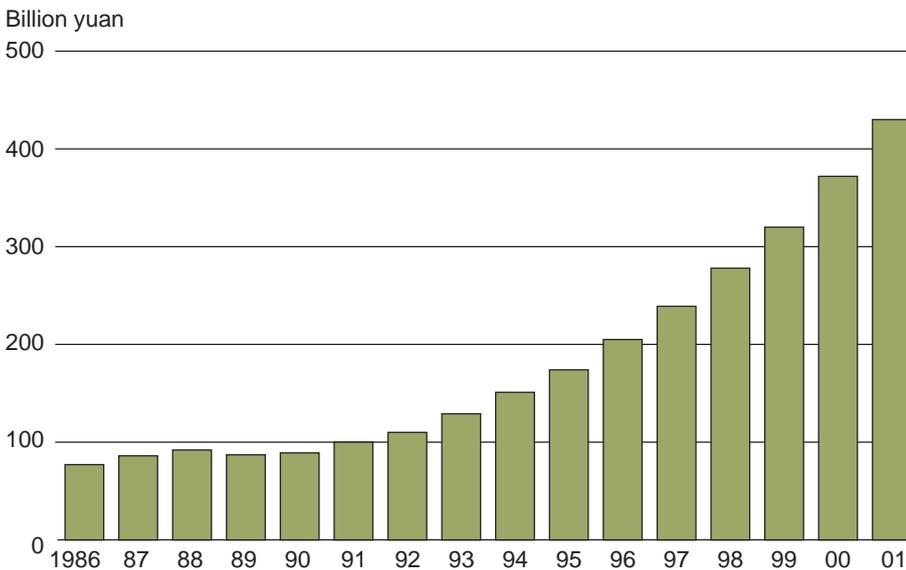
etables bought from large wholesale markets or other middlemen. During the winter, markets sell fresh fruits and vegetables grown in greenhouses or trucked in from southern provinces.

Under strict central planning (1958-78), consumption in China took a back seat to production and investment. Salaries and living standards were uniformly low, and Chinese officials sought only to ensure that the basic food needs of the population were satisfied.

Since embarking on market-oriented reforms in the 1980s, however, China has seen incomes and living standards rise. In the food sector, government planning has given way to markets and private enterprises intent on satisfying the increasingly discerning and sophisticated tastes of Chinese consumers. Other early reforms focused on production—allowing farmers and factory managers to pursue profits instead of government plans. In the 1990s, as the influence of government planners receded and it became clear that there would be no retreat from market-oriented reforms, China's consumer-oriented economy blossomed, opening the door for manufacturing, retail, and service industries.

China's increasingly affluent consumers are demanding a wider variety of food products, more processed food, and more convenient food. They are broadening their diets to include more poultry, eggs, dairy products, fish, and refined vegetable oils. Their diets now include smaller proportions of traditional staples—rice, wheat, vegetables, and pork. The result is a booming and rapidly changing food sector. Food manufacturing firms are growing, introducing new products, investing in modern equipment, and addressing food safety issues. Food retailing is moving from traditional farmers' markets and corner kiosks to modern "hypermarkets," convenience stores, and fast food restaurants. With an eye toward efficiency, transportation, storage facili-

### China food industry sales took off in the mid-1990s



Note: Food and beverage services industry (*can yin ye*) retail sales converted to constant 1999 yuan using the China urban price index. 1 U.S. dollar = 8.27 yuan.  
Source: China National Bureau of Statistics, *China Statistical Yearbook*, 2002.

### China's urban households consume less staple food and more poultry, seafood, oils, and dairy products

Food item	1990	2001
	<i>Pounds per person</i>	
Grain	289	176
Vegetables	306	256
Red meat	49	42
Poultry and eggs	24	35
Fish and shrimp	18	22
Vegetable oil	13	18
Dairy products	11	26
	<i>Number</i>	
Refrigerators owned per 100 households	29	82

Source: China National Bureau of Statistics, *China Statistical Yearbook*.

China's "Green Food" seal certifies a food has been grown in a relatively pollution-free environment with low chemical use.

Photo by Fred Gale, USDA/ERS



Photo by Fred Gale, USDA/ERS



ties, and distribution channels are being upgraded to accommodate the commercialization of the food sector.

### More Choices for Consumers

The transformation of China's rice market typifies many of the changes occurring in China's food sector. Until the 1990s, urban Chinese consumers purchased generic rice at set prices from government-run grain shops. Rice was usually procured by government authorities from local farmers, who tended to offer the government their lowest quality product. Rice was often broken and unpolished, and stones and other foreign material were often mixed in with the grain.

Today, China's rice industry is highly competitive, and rice is no longer a generic commodity. Consumers can choose among numerous brands differentiated by type, quality, and origin, and prices reflect rice attributes and quality. For example, in Beijing supermarkets, japonica (short-to-medium-grain) rice brands associated with

distant counties in northeastern provinces fetch premium prices because they have a reputation for high quality.

Chinese consumers' preferences for rice varieties tend to vary regionally, with differences based on rice attributes, including taste, texture, size of grain, stickiness, and cooking characteristics. Rice from countries known for high-quality japonica rice is prized in northern China and has been traditionally shunned by southern Chinese, who prefer long-grained indica rice. Now, however, japonica rice is widely consumed in wealthy southern areas, such as Shanghai and Zhejiang province. The availability of japonica rice in Shanghai illustrates how food markets are becoming national in scope, rather than local, as regional differences in tastes and preferences erode.

Environmental and safety concerns are also beginning to play a role in food consumption and production. Many brands of northeastern japonica rice now display the government-designated "green



Photo by Fred Gale, USDA/ERS

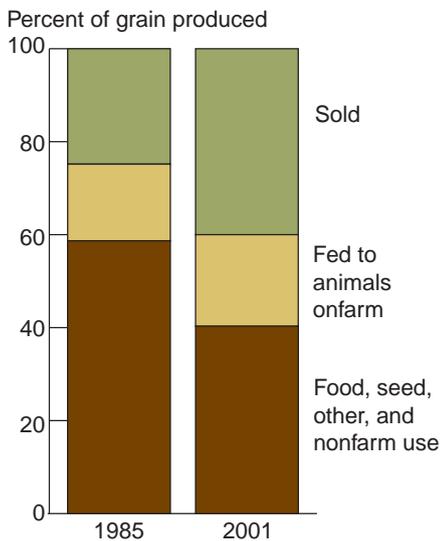
Japonica rice brands fetch premium prices because of their reputation for high quality.

**Rural diets still rely heavily on grains**

Food item	Rural residents	Urban residents
	<i>Pounds per person</i>	
Grain	524	176
Vegetables	240	256
Red meat	32	42
Poultry and eggs	17	35
Fish and shrimp	8	22
Vegetable oil	12	18
Dairy products	3	26
	<i>Number</i>	
Refrigerators owned per 100 households	14	82

Source: China National Bureau of Statistics, *China Statistical Yearbook*.

**China's farmers increased share of grain produced for the market, 1985 and 2001**



Source: China National Bureau of Statistics, *Rural Household Survey Yearbook*, 1991 and 2002.

food" seal, which certifies low use of chemicals and a relatively pollution-free production environment. China's Ministry of Agriculture has aggressively promoted the green food program to address concerns about excessive chemical use in China's food supply and build a reputation in world markets as a source of safe produce. Consumers are becoming aware of biotechnology issues in food production, and new labeling regulations for foods containing

genetically modified organisms were issued in 2001. In recent years, a number of widely publicized incidences of deaths and illnesses caused by foodborne pathogens have raised concerns about food safety standards and their enforcement.

**Urbanization Separates Producers and Consumers**

Until recent years, Chinese consumers and farmers were, for the most part, one and the same. In 1990, some 70 percent of the population were farmers, and Chinese farmers grew food largely for themselves. Farms needed to market only a small portion of their production to feed the relatively small urban population.

Rural-urban migration and growth in nonfarm employment opportunities have reduced the share of China's population living on farms. Estimates of China's farm population vary widely, but farmers now probably make up about half of the country's population. Thus, more people are buying their food instead of growing it themselves.

Rice industry experts in China say that rural-urban migration has helped raise demand for japonica rice. Wheat is the staple crop for farm households in the north China plain region. For example, rural people in the northern province of Shandong consume an average of 419 pounds of

wheat annually and only 11 pounds of rice. The national average for urban residents is about 53 pounds of wheat products and 101 pounds of rice. When farmers take up nonfarm jobs in northern cities, they increase their consumption of rice—usually japonica rice produced in north-eastern provinces—and reduce their consumption of wheat.

The striking difference between rural and urban food consumption patterns suggests that continued urbanization will significantly alter the structure of food demand in China. On a per capita basis, rural residents consume about three times as much grain per capita as do urban residents, but urban residents consume more of everything else. Urban households are much more likely than rural households to own refrigerators, increasing their ability to purchase perishable, chilled, and frozen foods (see box "Coastal Cities Lead the Way").

**Subsistence Gives Way to Commercial Farming**

The commercialization of China's food sector has also triggered a gradual transformation of the country's subsistence farms. In 1985, for example, Chinese farms sold just 25 percent of the grain they produced and consumed 75 percent onfarm as food, animal feed, or seed. By 2001, farms were selling 40 percent of their grain.

While many of China's farmers recognize the opportunities presented by consumer-driven agriculture, great challenges remain in commercializing the country's vast farm sector. China has some 200 million farms, averaging just 1.6 acres of cropland per farm. The country's collective land ownership bans land sales and makes it difficult for farmers to rent land, presenting an obstacle to increasing farm size and investing in mechanized equipment. The small scale and large number of Chinese farms makes it seemingly impossible to organize, monitor, and standardize

the quality of products. Conflicts have arisen as suppliers to food retail and restaurant chains have begun contracting with Chinese farmers unaccustomed to producing goods to such exacting standards. For example, suppliers to foreign fast food chains selling french fries have had difficulty procuring potatoes meeting the chains' quality standards. Suppliers to supermarkets must procure goods that meet standards for size, quality, color, and chemical residues. The large number of small farmers in China makes it difficult to monitor chemical and seed use to enforce green food standards, ensure sanitation in slaughter of livestock, and certify non-genetically modified food products.

Since the mid-1990s, Chinese agriculture officials have promoted a "companies leading households" strategy to bring farmers into the commercial food sector and raise their incomes. This strategy emphasizes links between farmers and processing and marketing companies to strengthen farmers' connections with the market and to raise farm incomes.

"Dragon head" or "leading" companies are selected or established by government authorities in localities to contract with farmers to procure produce with specific attributes. The dragon head company provides seed, operating loans, fertilizer and other inputs, and technical expertise. The company mills or otherwise processes the raw materials and sells products under a brand name often associated with the locality. For example, dragon head companies mill and package the northeastern japonica rice brands found in Beijing supermarkets. The companies contract with farm households in villages and townships to procure specific japonica rice varieties at a premium over open-market prices.

On the surface, China's "companies leading households" model resembles contract production common in U.S. agriculture. In the Chinese model, however, the government plays a much greater role. The

## Coastal Cities Lead the Way

China's food sector has developed most rapidly in its prosperous coastal areas, while change has been slower in central and western cities and in its vast network of rural towns and villages. Foreign restaurant and supermarket chains have entered coastal cities, such as Shanghai, Guangzhou, Shenzhen, Dalian, and Qingdao, drawn by their residents' purchasing power and their looser restrictions on foreign businesses. Restaurants, hotels, and supermarkets catering to expatriate businessmen, diplomats, and foreign tourists have played an influential role in the development of local food industries in some cities.

Rural areas and inland cities, where the vast majority of China's population lives, lag behind the coastal areas in income, purchasing power, and foreign investment. An inefficient distribution system and restrictions on inter-provincial trade have made it more difficult for imported foods to penetrate interior provinces. About half of China's population live on farms and rely heavily on self-produced grain, vegetables, and meat for their food supply. Still, Chinese supermarket chains have opened stores in many small towns and villages and are planning further expansion. If consumers in rural areas and inland cities imitate the food consumption habits of coastal cities, the impacts on China's food sector and its agricultural trade could be substantial.



Photo by Fred Gale, USDA/ERS

ownership structure of China's dragon head companies is not clear, but many seem to be spinoffs of local grain bureaus and other government marketing entities. Some are privately owned, and others are joint ventures with foreign companies. The government's role may include ownership, direction, or provision of land, facilities, credit, or subsidies. Management decisions seem to reflect government plans to develop particular sectors, sometimes resulting in overcapacity. Thus, while China's food sector appears to be privatized, the government still wields a heavy influence.

### Greater Trade Opportunities

Thus far, the changes sweeping across China's food sector have had a modest but growing impact on U.S. exports. Some U.S. chains, such as Kentucky Fried Chicken, McDonald's, Pizza Hut, and Wal-Mart, have expanded rapidly in China, but they pro-

cure most of their raw materials locally. Foreign brands of soft drinks, yogurt, sausage, potato chips, breakfast cereals, jellies, wine, and other foods and beverages comprise about 5 percent of products in Chinese supermarkets, but many of those products are also manufactured with local ingredients.

In some cases, however, the combination of growing demand and tariff reductions has boosted China's imports of foods and food ingredients. The most notable example is soybeans—now the largest U.S. agricultural export to China at \$1 billion per year. Growth in China's soybean imports was partly stimulated by increasing demand for refined cooking oil. Concurrently, demand increased for soybean meal used in high-protein animal feeds to satisfy growing consumer preferences for poultry, fish, and red meat. Imported apples, grapes, citrus, seafood,

dairy products, chicken feet, other cuts of meat, wine, and specialty vegetables are also becoming more common in China, although they are still mostly limited to high-end supermarkets, restaurants, and hotels in the largest cities. The United States has historically exported primarily bulk agricultural commodities to China, but exports of consumer-oriented food items have grown from insignificant amounts in the early 1990s to nearly \$300 million during 2002.

At the same time, U.S. farmers are facing greater competition from China in the world market. China is raising quality and safety standards, learning more about the world market, improving its marketing system, and becoming more competitive in many food sectors. During the 1990s, Japanese trading companies developed vegetable, mushroom, garlic, and poultry production bases in eastern China for

**U.S. consumer-oriented agricultural exports to China have risen dramatically since 1990**

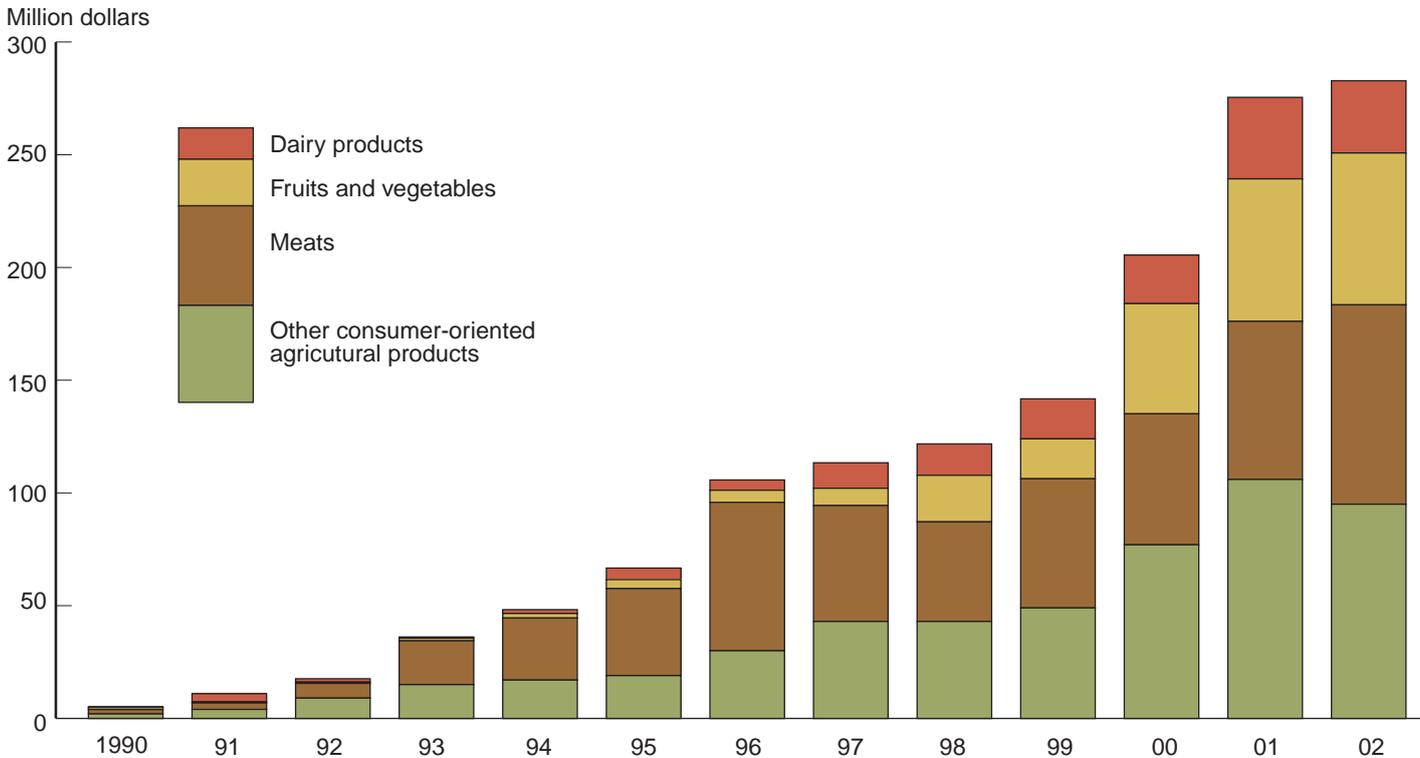




Photo courtesy of Wal-Mart Stores, Inc.

exports to Japan. China's surging exports of fresh vegetables could pose a threat to the large U.S. share of Japan's vegetable market. South Korean and Japanese companies have entered into joint ventures with northeastern dragon head companies to develop rice varieties suitable to tastes in their home markets. They have improved milling quality by equipping mills with world-class Japanese and Swiss machinery. China's share of the Japanese rice market more than doubled from 8 to 18 percent between 1995 and 2001.

Clearly, the commercialization of China's food sector is an important development. Changes in the organization and structure of agricultural production, food processing, and food distribution in China are transforming agricultural trade of the world's largest agricultural country. The vast size of the Chinese market offers opportunities for foreign companies but could also give Chinese agribusiness companies a platform to develop into major competitors in world food-related markets. **W**

## ERS Explores Changing China

The emergence of a consumer-driven commercial food sector in China is changing the way analysts look at the world's largest agricultural economy. Much of the attention given to food issues in China has focused on production and trade of bulk commodities, such as wheat, corn, cotton, rice, and livestock, most of which historically moved through government-controlled distribution channels. Economists know relatively little about the changing preferences of Chinese consumers and the commercialization of production, processing, marketing, and distribution in China's food sector.

ERS has begun to look at China's transformation. Observations and insights are contained in a number of ERS publications. An April 2002 publication, *China's Food and Agriculture: Issues for the 21<sup>st</sup> Century*, edited by Fred Gale, brought together leading authorities on Chinese agriculture in a series of 13 articles on emerging issues in China. This report is available at: [www.ers.usda.gov/publications/aib775](http://www.ers.usda.gov/publications/aib775)

Many of the changes occurring in China can be observed in its rice industry. A USDA-University of Arkansas research team traveled to China in July 2002 to study japonica rice production and trade. The research team—James Hansen, Frank Fuller, Fred Gale, Frederick Crook, Eric Wailes, and Michelle Moore—reported on changes in consumption, distribution, processing, and China's competitive potential in "China's Japonica Rice Market: Growth and Competitiveness." This article appeared in ERS's December 2002 *Rice Yearbook* and is available at: [www.ers.usda.gov/briefing/china/ChinaPDF/ChinasJaponicaRiceMarket.pdf](http://www.ers.usda.gov/briefing/china/ChinaPDF/ChinasJaponicaRiceMarket.pdf)

Japanese companies producing vegetables in China for their home market have led the way in developing many of the innovative arrangements that link small Chinese farms with final markets. A result of this effort is China's growing share of Japan's fresh vegetable market, a trend described by Sophia Wu Huang in "China Increases Exports of Fresh and Frozen Vegetables to Japan" and available at: [www.ers.usda.gov/publications/vgs/aug02/vgs292-01](http://www.ers.usda.gov/publications/vgs/aug02/vgs292-01)

Urbanization has major implications for both agricultural production and food consumption in China. "Small Town Development in China: A 21<sup>st</sup> Century Challenge," a Spring 2002 *Rural America* article by Fred Gale and Hongguo Dai, evaluates China's unique approach to urbanization and is available at: [www.ers.usda.gov/publications/ruralamerica/ra171/ra171b.pdf](http://www.ers.usda.gov/publications/ruralamerica/ra171/ra171b.pdf)

China's ambiguous landownership rights and restrictions on land sales and rentals are obstacles to the development of a commercial farm sector in China. In "The Ongoing Reform of Land Tenure Policies in China," Bryan Lohmar, Agapi Somwaru, and Keith Wiebe describe China's system of collective farmland ownership and how the system is adapting to the commercialization of the farm sector. This September 2002 *Agricultural Outlook* article is available at: [www.ers.usda.gov/publications/agoutlook/sep2002/ao294f.pdf](http://www.ers.usda.gov/publications/agoutlook/sep2002/ao294f.pdf)



Photo by Fred Gale, USDA/ERS

# Plant Genetic Resources

## New Rules for International Exchange

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**Botanist David Williams, with the International Plant Genetic Resources Institute in Cali, Colombia, receives a peanut landrace from a native farmer in the Amazonian lowlands of Ecuador.**

Photo by Karen Williams, USDA/ARS

All crops, whether traditional varieties selected and harvested by farmers or modern varieties bred by professional plant breeders, descend from wild and improved genetic resources (also called germplasm) collected around the world. Plant selection and breeding do not end once an improved variety is achieved because the challenges facing crop production—pests, pathogens, and climates—constantly evolve and change. To make crops more resistant to pests and diseases and to improve food supply quality, quantity, and variety, modern plant breeders continually seek genetic resources from outside the stocks with which they routinely work.

Since no nation has within its borders the desired spectrum of genetic resources, international collection and exchange occurs. Not all participants in this exchange, however, view the benefits as fairly balanced between donors and recipients. Another issue is that valuable genetic resources not yet collected and preserved may be endangered by land use changes in some countries.

To address these issues, delegates from 116 countries voted in November 2001 to adopt the text of a new United Nations International Treaty on Plant Genetic Resources for Food and Agriculture. When ratified or acceded to by 40 countries (17

have done so to date), the new treaty will enter into force and govern the international exchange of designated crop genetic resources. It will also attempt to resolve longstanding issues over how the benefits derived from the use of genetic resources are shared.

The success of the new treaty will depend to a great extent on whether its provisions actually facilitate international exchange and whether expectations are met concerning benefits sharing. When implemented, the treaty will affect the U.S., which has one of the largest national germplasm collections in the world and the largest national investment in plant breeding.

### Why Is Germplasm Important?

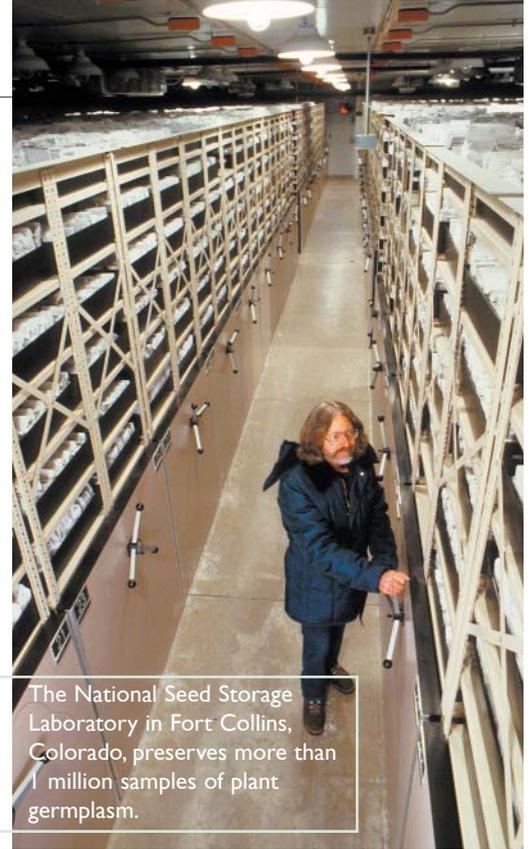
The relationship between access to genetic resources and agricultural production is often overlooked. The plant breeding process is complex and continual, and diverse genetic resources are a critical input. Advances in yield potential, pest resistance, quality, and other desirable traits in modern varieties have resulted from professional breeders crossing diverse parental genetic material. Farmers who rely on their crop output for seed or consumption and professional plant breeders both depend on crop genetic resources. In turn, the efforts of farmers and plant breeders can generate new genetic resources.

About 10,000 years ago, people in parts of Asia, the Near East, and Mesoamerica (modern-day Mexico and Central America) began to deliberately cultivate specific species. Over the generations, farmers selected and improved particular crops. In many parts of the world, this process continues today with farmer-developed varieties known as landraces (see box "Types of Germplasm"). Landraces have been adapted to specific environments, and the areas in which they grow host many diverse varieties.

The places of initial domestication of different crops are called "centers of ori-

gin," many of which are in today's developing countries (see map, opposite page). Most crops of major economic importance to the U.S. originated elsewhere. In addition, genetic resources from around the world continue to play a critical role in maintaining varietal improvement in U.S.-produced crops (see box "Modern Plant Breeding"). For example, the genes that provide resistance to yellow dwarf disease in U.S. barley varieties were obtained from Ethiopia. The sources of resistance to stem rust disease for U.S. commercial wheat varieties include a wild plant originating in the Caucasus and a Spanish durum landrace.

The U.S. is also a leading participant in the international collection and exchange of crop genetic resources. Holdings in the U.S. National Plant Germplasm System (NPGS) exceed 450,000 accessions, comprising 10,000 species of the 85 most commonly grown crops, making the U.S. system one of the largest national gene banks in the world. NPGS includes publicly funded collections located across the country as well as centralized facilities for plant exploration coordination, quarantine, and long-term germplasm storage. Although most of the NPGS germplasm is not native to the U.S., the costs of collecting and preserving



The National Seed Storage Laboratory in Fort Collins, Colorado, preserves more than 1 million samples of plant germplasm.

Photo by Scott Bauer, USDA/ARS

germplasm have been borne almost entirely by the U.S.

Although relatively few major crops originated in the U.S., sample collection efforts, extensive plant breeding, and germplasm regeneration have made the U.S. a net supplier of plant germplasm to the rest of the world. Between 1993 and 2002, NPGS sent more than 1.2 million samples to requestors free of charge, with 30 percent of the samples going to requestors in foreign countries. Overall, the U.S. distributed about seven times

## Types of Germplasm



**Advanced (or elite) germplasm** includes 1) "cultivars," or cultivated varieties, which are suitable for planting by farmers, either recently developed cultivars or "obsolete" cultivars that are no longer grown, and 2) advanced breeding material that breeders combine to produce new cultivars (sometimes referred to as "breeding materials").

**Improved germplasm** is any plant material containing one or more traits of interest that have been incorporated by scientific selection or planned crossing.

Modern dent corn, U.S.



**Landraces** are varieties of crops improved by farmers over many generations without the use of modern breeding techniques. Within a modern breeding program, landraces are sometimes used for resistance traits, and extensive efforts are generally required before their genes can be used in a final variety.

Current maize landraces, central Mexican highlands. Photo by Hugh Iltis

Centers of origin of selected crops



Note: The pointer locations indicate general regions where crops are believed to have first been domesticated. In some cases, the center of origin is uncertain. Other geographic regions also harbor important genetic diversity for these crops.

Source: This map was developed by the General Accounting Office using data provided by the National Plant Germplasm System's Plant Exchange Office.



**Wild or weedy relatives** are plants that share a common ancestry with a crop species but have not been domesticated. These plants can serve as another source of resistance traits, but these traits can be very difficult to incorporate in final varieties.

Teosinte (possible maize ancestor) and reconstructed possible early maize ear.  
Photo by John Doebley



**Genetic stocks** are mutants or other germplasm with genetic abnormalities that may be used by plant breeders for specific purposes. Genetic stocks are often used for highly sophisticated breeding and basic research.

Photo provided by the Maize Genetics Cooperation--Stock Center, NPGS, supported by USDA/ARS.

## Modern Plant Breeding

Generally, plant breeders prefer to work with existing cultivars or advanced breeding materials (sometimes called elite materials) because these adapted sources of material are already highly productive and relatively easy to intermate. But because pests and diseases evolve over time, breeders continually need new and diverse germplasm from outside the standard gene pool to find specific traits to maintain or improve yields. Sometimes as a last resort, breeders rely on landraces and wild relatives of crops, but these generally carry unwanted traits that are linked with a desirable trait's gene, making it difficult to incorporate the trait into high-yielding cultivars. When used, however, genes from landraces or wild relatives often have had disproportionately large and beneficial impacts. Some breeders also seek and use traits and information from "genetic stocks," which include mutants and other germplasm with genetic abnormalities.

The advent of biotechnology may expand the scope of desired traits that can be incorporated in new varieties. The use of biotechnological techniques, such as molecular markers, may make it easier to incorporate the beneficial characteristics of landraces and wild relatives of agricultural crops. Biotechnology also can be used to incorporate traits from very disparate species. The challenges of developing pest and disease resistance and improvements in yield potential remain the same regardless of whether a plant is conventionally bred or bioengineered.

more germplasm internationally than it received from international sources between 1990 and 1995. Such international germplasm transfers, as well as new international acquisitions, may be subject to the provisions of the new treaty after it enters into force.

Besides the number of samples distributed, another significant contribution of NPGS is the breadth of material provided, which includes landraces, wild relatives, and genetic stocks. NPGS has also added to the improved germplasm accessible to international breeders. More than 40 percent of the U.S. samples distributed internationally in 1990-95 were advanced or improved materials "created" through research and breeding.

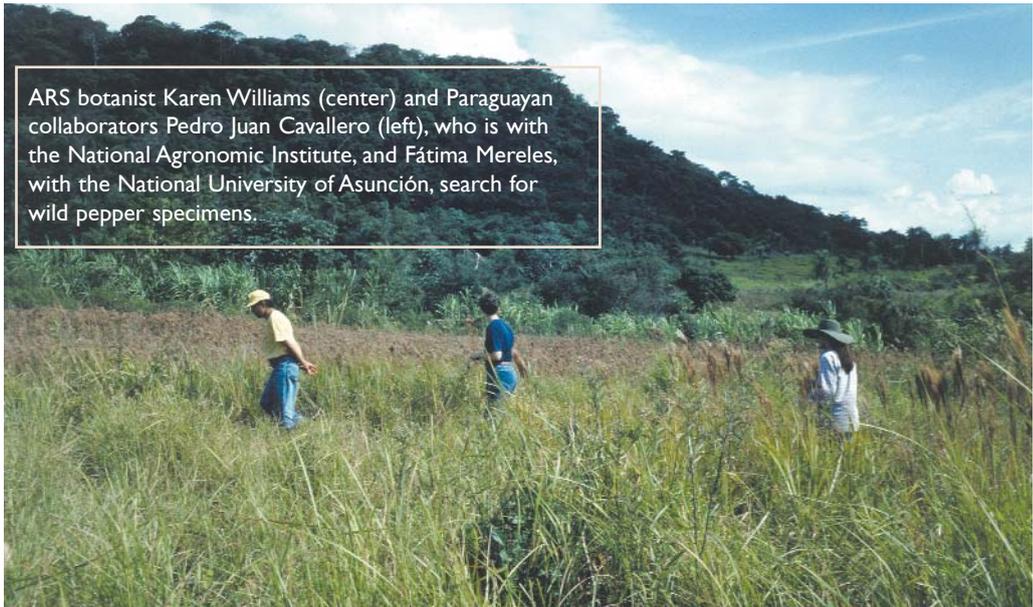
## International Issues and Agreements

Historically, plant genetic material was generally freely collected and shared. Today's developing countries—with a wealth of biological diversity in situ (in the wild and on fields)—were often the source of raw genetic material collected by public gene banks worldwide.

Now, however, critics argue that unrestricted access to germplasm unaccompa-

nied by benefit sharing results in an inequitable system of exchange. For example, freely shared crop traits from donor countries could be incorporated into varieties by researchers in developed countries and then sold back to donor country farmers by private seed companies. The lack of direct compensation is seen as giving donor countries little incentive to conserve genetic resources, some of which are now at risk of extinction. Proponents counter that a system of "free exchange" indirectly compensates lower income countries for donations of raw genetic materials in two ways. First, these countries have had free access to public gene banks, whose holdings include improved varieties. Second, many lower income countries are net importers of food, and consumers in those countries benefit from lower world food prices made possible by genetic improvements, regardless of where the improvements were made.

Several international agreements have sought to further the preservation of genetic resources and to balance the sharing of benefits generated by their use. In 1983, the Commission on Plant Genetic Resources (now the Commission on Genetic Resources for Food and



ARS botanist Karen Williams (center) and Paraguayan collaborators Pedro Juan Cavallero (left), who is with the National Agronomic Institute, and Fátima Mereles, with the National University of Asunción, search for wild pepper specimens.

Photo by David Williams, USDA/ARS

Agriculture) was established under the auspices of the Food and Agricultural Organization (FAO) of the United Nations. The Commission developed the International Undertaking, a nonbinding treaty to govern the exchange of genetic resources, but some developing and developed countries (including the U.S.) did not commit to its implementation. In 1992, the U.N. Convention on Biological Diversity (CBD) was established, with a focus on the preservation of biodiversity, especially those genetic resources with pharmaceutical and industrial rather than agricultural uses. In an attempt to ensure equitable returns to donor countries for the use of native resources (and to spur conservation), the CBD granted nations sovereign rights to genetic resources within their borders, which in practice meant both non-agricultural and agricultural germplasm. The U.S. has signed, but not yet ratified, the CBD.

International agreements on intellectual property rights also have implications for genetic resource conservation. Stronger intellectual property rights provide incentives for private research and development (R&D) investment, and, in theory, also enhance incentives for conserving genetic resources. However, intellectual property law varies from country to country and may not cover unimproved germplasm and farmer-developed varieties. The World Trade Organization's (WTO) agreement on Trade-Related Aspects of Intellectual Property Rights has provisions that can affect the exchange of germplasm. WTO member countries must commit to implementing a system protecting intellectual property for plant genetic resources, and noncompliance can result in sanctions.

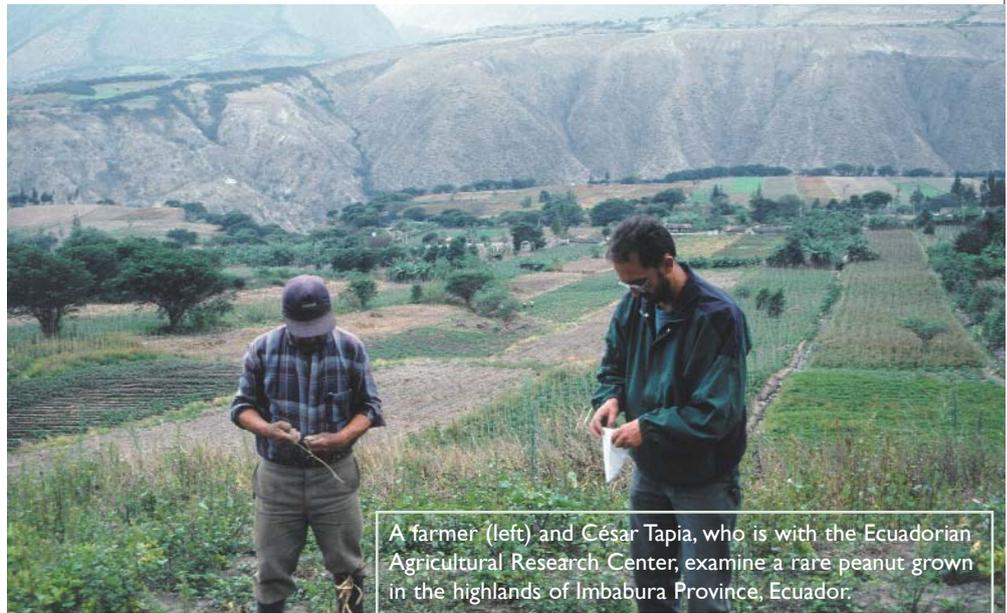


Photo by Karen Williams, USDA/ARS

A farmer (left) and César Tapia, who is with the Ecuadorian Agricultural Research Center, examine a rare peanut grown in the highlands of Imbabura Province, Ecuador.

### The New Treaty

The new International Treaty on Plant Genetic Resources for Food and Agriculture was intended to bring the International Undertaking into conformity with the CBD. After lengthy negotiations, delegates from 116 countries adopted the text of the treaty in November 2001, with the American and

Japanese delegates abstaining. The U.S. signed the treaty in November 2002, but ratification will require the State Department to submit the treaty to Congress for approval.

The new treaty has several objectives. First, it mandates the conservation and sustainable use of plant genetic resources

### Crops covered under the International Treaty on Plant Genetic Resources for Food and Agriculture

- |  |                             |
|--|-----------------------------|
| Apple  | Lentil                      |
| Major aroids: includes taro, cocoyam, dasheen, and tannia                                | Maize (corn)                |
| Asparagus  | Oat                         |
| Banana/Plantain  | Pea                         |
| Barley   | Pearl millet                |
| Bean   | Pigeon pea                  |
| Beet   | Potato                      |
| Brassica complex: includes cabbage, rapeseed, mustard, cress, rocket, radish, and turnip | Rice                        |
| Breadfruit   | Rye                         |
| Carrot   | Sorghum                     |
| Cassava  | Strawberry                  |
| Chickpea   | Sunflower                   |
| Citrus   | Sweet potato                |
| Coconut  | Triticale                   |
| Cowpea   | Wheat                       |
| Eggplant   | Yam                         |
| Faba bean / Vetch  | <b>Forages</b>              |
| Finger millet  | 15 genera of legume forages |
| Grass pea  | 12 genera of grass forages  |
|  | 2 genera of other forage    |



Rice germplasm from the Philippines is monitored for fungal diseases before release to U.S. breeders.

USDA/ARS photo

for food and agriculture. Second, it seeks fair and equitable sharing of benefits arising out of the use of these resources. Finally, it establishes a multilateral system to facilitate access to all crops listed in Annexes I and II of the treaty (see box "Crops covered under the International Treaty...") and to share the benefits derived from such facilitated access under the terms of a standard Material Transfer Agreement (MTA). The treaty specifies that the terms of the standard MTA will be established by the Governing Body at its first meeting after the treaty enters into force.

Much remains to be resolved. Application of intellectual property rights to plant genetic resources remains a contentious issue. Precisely how benefits will be shared has yet to be determined and is complicated by:

- A lack of consensus regarding what "equitable" benefit sharing means.
- Disagreement over how to estimate the magnitude of benefits derived from use of shared germplasm.

- Substantial variability in benefit estimates derived from similar assessment methods.

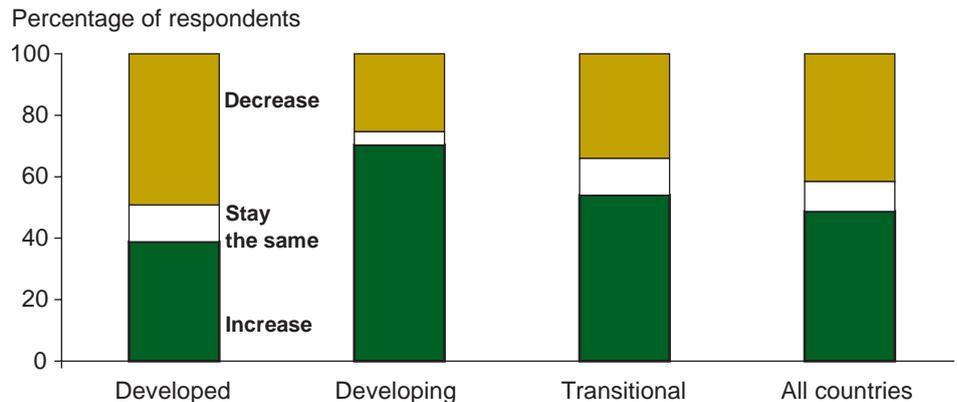
Unlike the CBD, which provides for bilateral negotiations to establish the terms of access and benefit sharing for each specific exchange of materials, all germplasm exchanges under the multilateral system will be subject to the standard MTA. Monetary benefits will be paid to a fund established by the Governing Body.

This fund will be used primarily to support farmers who conserve and sustainably use plant genetic resources for food and agriculture, especially such farmers in developing countries or in countries with economies in transition.

In October 2002, the FAO Commission on Genetic Resources for Food and Agriculture, in its capacity as the interim committee of the treaty, agreed to establish an Expert Group to develop and propose recommendations on the terms of the standard MTA. The Expert Group will include representatives from each FAO region and will provide advice on the level, form, and manner of benefit-sharing payments. They will also make recommendations regarding the level of payments to be made by various categories of recipients and the conditions under which recipients may be exempt from making payments. The first meeting of the Expert Group is tentatively scheduled for summer 2003.

The new treaty addresses the financing of germplasm conservation only in general terms, making this aspect of the treaty potentially difficult to implement. The overall impact of the treaty is also limited by its omission of soybeans, peanuts, and

**International demand for U.S. germplasm is expected to be strong over the next decade, especially in developing countries**



Based on responses of international recipients of U.S. germplasm to questions regarding their expected future use.

Source: Study conducted by International Plant Genetic Resources Institute.



Photo by Scott Bauer, USDA/ARS

## Utility of NPGS Materials

A team of ERS, academic, and international researchers studied the utility of materials distributed internationally from 1995 to 1999 by the U.S. National Plant Germplasm System (NPGS), focusing on 10 major crops (barley, beans, corn, cotton, rice, potatoes, sorghum, soybean, squash, and wheat). International recipients indicated that 11 percent of the samples received during the 5-year period had already been incorporated into breeding programs in their respective countries. Another 42 percent of the received samples were still being evaluated and 19 percent had been useful in other ways, such as material for basic research, an often overlooked benefit. Only 28 percent of materials were reported to have been not useful by the respondents. Recipients in developing countries found NPGS materials especially useful, reporting that 16 percent of the germplasm samples had already been used in breeding programs, about three times the share reported by respondents in developed and transitional economies.

Original recipients of NPGS germplasm can distribute that germplasm to additional users, generating secondary benefits. International recipients shared an estimated 18 percent of all NPGS germplasm samples with users within their own institutions and 10 percent with users at other institutions.

In addition to the NPGS germplasm itself, data about the germplasm, when available, also provide benefits. For example, data on a sample's varietal characteristics and yield can speed the research and breeding process. For the 10 crops in the study, respondents reported that 28 percent of NPGS samples had data for the trait they were specifically seeking, and 18 percent had data useful for other purposes.

other major world crops from the list of 35 crops covered (see box "Crops covered under the International Treaty...").

### Future International Reliance on Germplasm Exchange

As the new treaty is implemented, much of the focus will be on how countries can reap the benefits of their genetic resource holdings. However, the returns generated by any one set of genetic resources are very uncertain and, given the lengthy time associated with plant breeding, such returns are not likely to be realized quickly. Far more certain is the critical role that genetic resources play in the breeding process. Few countries are germplasm-rich with respect to all their major crops. Dependence on genetic resources from other nations is a significant factor for developed and developing countries alike.

Expectations of international recipients of NPGS germplasm provide some indication of future demand for public germplasm. According to a study by ERS, academic, and international researchers, most international recipients expected their demand for NPGS resources to increase or stay the same (see box "Utility of NPGS Materials"). A higher share of recipients in developing countries indicated they would increase their requests from the NPGS in the next decade than did recipients from either developed or transitional economies.

Because the NPGS plays such a significant role in providing germplasm worldwide, the U.S. has assumed a responsibility not only to its own crop breeders, but also to crop breeders throughout the world. Since NPGS genetic resources are particularly valuable to developing countries, given their limited funds for germplasm management, the provisions of

the International Treaty have the potential to affect users of U.S. germplasm far beyond this country's borders. At the same time, the treaty could also affect the international exchange of diverse germplasm needed by plant breeders to maintain and improve U.S. crops in the future. **W**

#### This article is drawn from...

*The Demand for Crop Genetic Resources: International Use of the U.S. National Plant Germplasm System*, by M. Smale, and K. Day-Rubenstein, *World Development*, Vol. 30, No. 9, 2002; an earlier version is available at: [www.ifpri.org/divs/eptd/dp/eptdp82.htm](http://www.ifpri.org/divs/eptd/dp/eptdp82.htm)

"ARS is Banking on Germplasm," by David Elstein, in *Agricultural Research*, February 2003, available at: [www.ars.usda.gov/is/AR/archive/feb03/germ0203](http://www.ars.usda.gov/is/AR/archive/feb03/germ0203)

International Treaty on Plant Genetic Resources for Food and Agriculture, available at: [www.fao.org/cpgrfa](http://www.fao.org/cpgrfa)



Corbis

# Aiming for Targets, Saving on Arrows

## Insights from Two USDA Food Assistance Programs



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Efficiency involves converting the least amount of inputs into the greatest amount of outputs, which is important not only in farming but also in food assistance programs. In farming, physical inputs (land, labor, seeds, fertilizer, and others) are converted into output (crops and livestock). In USDA's food assistance programs, taxpayer dollars are the inputs. The outputs are the programs' goals: to provide needy persons with access to a more nutritious diet, to improve the eating habits of the Nation's children, and to help America's farmers by providing an outlet for the distribution of food purchased under farmer assistance authorities. Both farmers and USDA strive to operate efficiently.

In program analysis, the term "targeting" is often interchangeable with "efficiency." In recent years, Congress and USDA have been particularly interested in operational targeting—focusing on how the Nation's food assistance programs are administered—and benefits targeting—focusing on who is served. Each taxpayer dollar used to fund a program can be thought of as an arrow that policymakers send toward a policy target, or program goal. Metaphorically, operational targeting is the effort to shoot an arrow at a target at a low cost, while benefits targeting is the effort to hit the bull's-eye—getting program benefits to the most needy.

Over the years, USDA has endeavored to operate food assistance programs efficiently. The Federal Government and the States continually seek to identify policies and procedures by which program participants can be served at a low cost or the needy can be more effectively targeted. USDA has recently initiated innovative targeting efforts in two of its child nutrition programs.

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**“While guidelines targeting determines which households are eligible for a program, benefits targeting determines whether or not program participants all receive the same level of benefits.”**

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**Program Design Has One Pair of Targeting Decisions . . .**

In programs designed to serve recipients most in need, benefits may be targeted in two ways—through eligibility guidelines and through the schedule of benefits. Eligibility guidelines are the criteria households must meet to receive program benefits. Eligible households become program participants only if they choose to apply. Household income, adjusted for family size, is a major criterion for USDA food assistance programs. Age, nutritional risk, breastfeeding status, and workforce status are among other

factors that can determine eligibility.

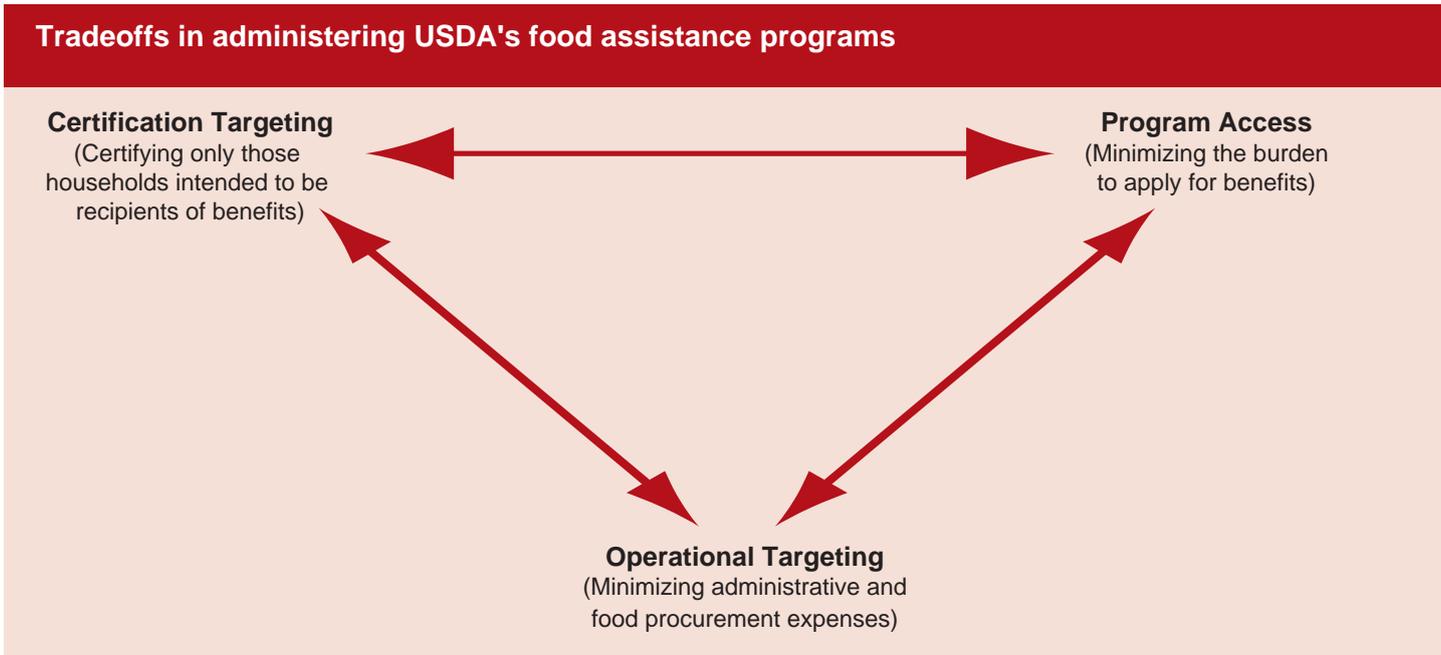
If program eligibility guidelines are broad instead of narrow, the numbers of households that qualify for and can participate in the program increase, which can support program goals (such as improved nutrition). However, as participation rises, so too do program expenses.

Policymakers pursue *guidelines targeting* by balancing the additional cost of broader eligibility guidelines with the gains in terms of program goals.

While guidelines targeting determines which households are eligible for a program, *benefits targeting* determines whether or not program participants all receive the same level of benefits. Benefits targeting links benefits to income in an effort to provide greater program benefits to households that have the lowest incomes. For example, Food Stamp Program benefits are highest for households with no income (net of



USDA Photo



certain allowed deductions). Benefits are reduced by 30 cents for each dollar of income. Similarly, the National School Lunch Program provides three different amounts of USDA subsidies for lunch, depending on the income of a child's household. In contrast, a breastfeeding mother who participates in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) receives a fixed package of specific foods (such as carrots and tuna fish) regardless of her household's income, so long as the income does not exceed WIC's income-eligibility threshold. If a low benefit level reduces participation of higher income households, there is a tradeoff between encouraging participation of higher income households and targeting benefits.

**...While Program Administration Has Another Pair**

For a program to serve its intended recipients at low cost, two additional types of targeting may be used in the administration of food assistance programs. Local program offices try to exclude ineligible households from receiving approval, or being certified, when the household

applies for benefits. *Certification targeting*—providing certification only to those households who are intended to be recipients of program benefits—requires local program offices to obtain household-specific information. Information such as income, household size, and other household characteristics is used to determine if a household is eligible. Certification typically lasts from 1 to 12 months, after which information is again required to determine whether participating households continue to meet eligibility guidelines.

A local program office can obtain a household's information using various methods of increasing thoroughness, such as asking the household, requiring supporting documents (such as pay stubs), and using third-party verification (such as employers) to ensure the authenticity of the documents. An increase in the thoroughness of the application process can be expected to enhance certification targeting by reducing inaccuracies and increasing compliance with eligibility guidelines.

Denying program benefits to ineligible households helps maintain public confidence in USDA food assistance programs. However, increased thoroughness comes

with a price: increased burden—on both ineligible and eligible households—and increased administrative expense. A high level of burden may deter some households from applying for benefits for which they are eligible. Policymakers must strike a balance between certification targeting, on the one hand, and both program accessibility and administrative expense on the other.

*Operational targeting* seeks to minimize administrative and food procurement expenses. At the extreme, the administrative cost of certifying households could be slashed by closing all but one of the local program offices in an entire State. Likewise, administrative expenses could be saved if nothing—not even an application—was required for a household to receive program benefits. Of course, eliminating the application would negate certification targeting. And widespread office closures would greatly inconvenience many eligible households and diminish their program access and participation, thereby countering the goals of the program. Thus, there can be tradeoffs between operational targeting and other desirable outcomes.

## Operational Targeting and WIC Cost Containment

The mission of WIC is to safeguard and improve the health of low-income pregnant, breastfeeding, and postpartum women and infants and children up to age 5 who are at nutritional risk. To achieve its mission, the program provides a package of supplemental foods, nutritional education, and health care referrals.

WIC State agencies adopt various cost-containment practices to reduce food costs. The practices include:

- Limiting food item selection according to brand, package size, form, or price (for instance, requiring purchase of least-cost items).
- Limiting authorized food vendors to those with lower food prices.
- Negotiating rebates with food manufacturers or suppliers.

Some observers have raised concerns that if cost-containment policies are overly restrictive, then WIC participants' access to and consumption of prescribed foods may be reduced. Others have questioned whether cost-containment practices save enough in food costs to offset their additional administrative costs.

In 1998, Congress instructed ERS to assess the effects of WIC State agencies' cost-containment practices (other than manufacturers' rebates on infant formula) on such outcomes as program costs, participant satisfaction, and the purchase and consumption of prescribed WIC foods. The study was conducted in six States (California, Connecticut, North Carolina, Ohio, Oklahoma, and Texas) selected to represent various combinations of cost-containment practices.

The study found that cost-containment practices can be inexpensive to operate. In the four States

**“Administrative costs for the cost-containment practices analyzed in this study averaged less than 1.5 percent of estimated food package savings.”**

with substantial food item restrictions, administrative costs for the cost-containment practices averaged less than 1.5 percent of estimated food package savings.

Annual estimated cost savings for a State depend on the State's particular cost-containment practices and the size of its WIC caseload. California and Texas, two States with large WIC caseloads, had annual cost savings estimated at \$40 million and \$66 million, respectively, while Oklahoma had annual savings estimated at

\$6.7 million. Of the six States, Ohio had the smallest cost savings of \$148,000, an outcome that is consistent with Ohio's limited restrictions on the food items WIC participants can purchase.

What were the effects of cost-containment practices on WIC participants? Most surveyed WIC partici-

pants reported that they were satisfied with the available brands of food and package sizes approved for WIC by their State. There were exceptions, however. In Connecticut and Ohio, where purchases of cheese are restricted to the least expensive brand available in the store, WIC participants reported lower levels of satisfaction with allowed cheese brands than participants in the four other States. In Oklahoma, cereal purchases are restricted to store- and private-label brands, which reduced participant satisfaction with allowed brands in that State. Nevertheless, when overall satisfaction levels in States with restrictions are compared with levels in the non-restrictive States, the differences are small and statistically insignificant. Moreover, according to survey responses, cost-containment practices did not diminish the amounts of monthly allotments that WIC participants purchased or consumed.

The single largest cost-containment strategy in WIC is its infant formula rebate program. Although WIC encourages mothers to breastfeed, a majority of participating infants receive infant formula through WIC. WIC State agencies typically use competitive bidding to award a contract to a single manufacturer of infant formula for the exclusive right to provide its product to WIC participants in the State. The contract-win-



Photo courtesy of Jeffrey Kaufman



Photo courtesy of Jeffrey Kaufman

ning manufacturer is then billed for the amount of the rebates on the formula issued for WIC infants. In fiscal year 2001, infant formula manufacturers provided States with \$1.5 billion in rebates, an amount that supports 28 percent of WIC participants. To support the same number of WIC participants in the absence of these rebates would require an equivalent increase in taxpayer expenditures.

**Benefits Targeting in CACFP**

The aim of the Child and Adult Care Food Program (CACFP) is to promote healthful meals in child and adult care settings. In the child care portion of CACFP, the program reimburses participating family child care homes and child care centers for meals and snacks. In the mid-1990s, Congress raised concerns about the types of families most often served by CACFP family child care homes. In 1995, only 21 percent of meal reimbursements to CACFP child care homes were for meals served to

**“In fiscal year 2001, infant formula manufacturers provided States with \$1.5 billion in rebates, an amount that supports 28 percent of WIC participants.”**

low-income children. A meal served in CACFP child care homes received the same reimbursement rate irrespective of the child’s family income.

To target program benefits more intensely on low-income children, Congress lowered the per meal subsidies, effective in mid-1997, on meals generally served to higher income children (see box “Tiering at a Glance”). This tiering system represents a compromise between a single-rate system and a system that can create a potential barrier to participation by requiring determination of family income on a child-by-child basis. Before 1980, CACFP required family child care providers to document each family’s income. Care

providers complained that the determination of family income was burdensome and too invasive for their relationship with the families whose children they served. Few family child care providers participated in CACFP prior to 1980, possibly due in part to this factor.

In 1996, Congress asked ERS to examine the effects of reduced meal reimbursements for CACFP family child care homes. The study found that, as intended, the subsidy reduction did concentrate benefits more intensely on low-income children, improving benefits targeting. The share of CACFP meal reimbursements to CACFP child care homes for meals served to low-income children more than doubled, from 21 percent in 1995 to 45 percent in 1999. Over the same period, CACFP child care homes served 80 percent more low-income children and 23 percent fewer higher income children. Between 1997 and 1999, following the subsidy reduction, the number of family child care homes reimbursed



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## Tiering at a Glance

For child care homes participating in the Child and Adult Care Food Program (CACFP), Congress replaced a single-rate reimbursement system with a two-tiered system that took effect July 1, 1997. Under the tiering system, the rates for Tier 1 meals, meant to be served generally to low-income children, were similar to the pre-existing rates, while the rates for Tier 2 meals, meant to be served generally to higher income children, were reduced. The Tier 1 and Tier 2 rates that took effect in mid-1997 were, respectively, \$0.90 and \$0.34 for breakfast; \$1.65 and \$1.00 for lunch/supper; and \$0.49 and \$0.13 for snacks.

In fiscal year 1999, reimbursements to Tier 2 homes averaged \$177 per month but would have averaged \$326 per month if those homes had received Tier 1 rates for those same meals. Tiering lowered meal reimbursements to Tier 2 homes by 46 percent on average across meals, or by about \$33 per week per home.

Congress established two main criteria by which a meal qualifies for Tier 1 reimbursement rates:

- A CACFP home located in a low-income area qualifies for Tier 1 rates on all meals (an area is considered low-income if 50

percent or more of the children at the local elementary school have been approved for free or reduced-price school meals, or if 50 percent or more of the children in the area are in families with incomes at or below 185 percent of the Federal poverty guidelines as measured by the most recent decennial census); or

- A CACFP home operated by a low-income care provider qualifies for Tier 1 rates on all meals.

In addition, a CACFP home that is classified as Tier 2 (it does not meet either of the above criteria) can receive the higher Tier 1 rates on meals served to low-income children.

The current reimbursement system is not designed to prevent totally the payment of a Tier 1 rate for a meal served to a higher income child. By the first two criteria above, a home in a low-income area or operated by a low-income provider receives Tier 1 rates on all meals, including those served to higher income children. Nevertheless, the tiering system has concentrated program benefits on children from low-income families relative to the single-rate system it replaced.



Photo by Scott Bauer, USDA/ARS



USDA photo

at the lower Tier 2 rate fell, while the number of family child care homes receiving the higher Tier 1 rate increased.

According to the study, in 1999, Tier 2 CACFP child care homes spent on average \$91 per week on food—\$19 less than Tier 1 homes. Also, despite this difference in food expenditures, the subsidy reduction apparently had little if any effect on the array of meals or snacks (breakfast, lunch, etc.) offered by a typical Tier 2 home.

To qualify for reimbursement, a CACFP meal must contain specified combinations of four meal components: milk; fruit, vegetables, and juice; bread (and bread alternatives); and meat (and meat alternatives). The study found that the subsidy reduction did not reduce compliance with meal component requirements. The study also compared the nutritional content of the foods served by Tier 2 homes in 1999 with the nutritional content of foods served by similar CACFP homes in 1995. In most respects, there were no significant differences. However, meals served in Tier 2 homes in 1999 contained more calories than meals served in 1995.

### Lessons and Cautions

In striving to make efficient use of taxpayer dollars in the design and administration of USDA food assistance programs, policymakers pursue various types of targeting. WIC cost-containment practices implemented by six States were relatively inexpensive to administer and reduced food costs. Operational targeting was improved with few adverse impacts on WIC participants. The subsidy reduction in CACFP meal reimbursements targeted program benefits more intensely on low-income children, as intended. Benefits targeting was improved, with little if any effect on the components or nutritional content of meals served in the reduced-subsidy homes.

Caution should be exercised when using a study's results to make inferences about possible effects of related policies. What would happen if WIC cost-containment practices in restrictive States were made yet more stringent? Or what would happen if CACFP meal reimbursements were made yet smaller for Tier 2 homes? It is possible that negative outcomes would be more severe than those reviewed here. Moreover, for cost-containment practices to work, they need to be managed well by

State officials. The success of cost containment in the six study States was the result of ongoing efforts by the States to find those restrictions that both reduced food costs and were acceptable to participants. Therefore, even if a particular cost-containment practice improves operational targeting in one State, a different State may have a different experience.

Careful research can address issues surrounding the magnitudes of desired outcomes and adverse side effects. Sometimes a negative effect is sufficiently small that—once research obtains a measure of the effect—policymakers may decide it can be ignored. On the other hand, if negative consequences turn out to be large, the response may be to recalibrate policy if policymakers deem the benefits of such adjustment exceed the costs. Indeed, the States in the WIC cost-containment study engaged in a dynamic process of assessing cost savings and participant responses. Crafting food assistance policies is an ongoing process involving the affected groups, policymakers, and researchers who help to measure the sizes of the consequences at stake. **W**

### This article is drawn from . . .

*Reimbursement Tiering in the CACFP: Summary Report to Congress on the Family Child Care Homes Legislative Changes Study*, by William Hamilton, Nancy Burstein, and Mary Kay Crepinsek, FANRR-22, ERS/USDA, March 2002, available at: [www.ers.usda.gov/publications/fanrr22](http://www.ers.usda.gov/publications/fanrr22)

*Assessment of WIC Cost-Containment Practices: Executive Summary*, by John A. Kirlin, Nancy Cole, and Christopher Logan, E-FAN No. 03-004, ERS/USDA, February 2003, available at: [www.ers.usda.gov/publications/efan03004](http://www.ers.usda.gov/publications/efan03004)

*Infant Formula Prices and Availability: Final Report to Congress*, by Victor Oliveira, Mark Prell, David Smallwood, and Elizabeth Frazao, E-FAN No. 02-001, ERS/USDA, October 2001, available at: [www.ers.usda.gov/publications/efan02001](http://www.ers.usda.gov/publications/efan02001)



# Rural Welfare Reform Lessons Learned

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EyeWire

Welfare reform legislation enacted in 1996 under the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) dramatically altered the social safety net for poor Americans. PRWORA, designed to reduce long-term welfare dependency by increasing self-sufficiency through employment, has gone a long way toward achieving this goal. At the national level, welfare participation has declined substantially, and the employment and earnings of poor single mothers—the group most likely to receive public welfare benefits—have increased while their poverty rates have fallen.

Recent evidence suggests, however, that successful welfare reform outcomes may depend in part on where welfare recipients live. What has been the experience, for example, of the almost 8 million people living in poverty in rural America compared to central cities and suburban communities? In rural areas, employment is more concentrated in low-wage indus-

tries (see “Low-Skill Workers Are a Declining Share of All Rural Workers,” p. 10); unemployment and underemployment are greater; education levels are lower; and work support services, such as formal paid child care and public transportation, are less available. In these less favorable circumstances, how well has welfare reform worked in moving rural low-income adults into the workforce and out of poverty?

With congressional reauthorization of welfare legislation scheduled for 2003, ERS addresses two questions to inform the policy debate surrounding reauthorization: What have we learned from empirical studies about rural-urban differences in welfare reform effects on program participation, employment, and poverty? Do rural and urban low-income families have different needs that might be reflected in the design of policies meant to provide assistance?

## Key provisions of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996

### Establishes Temporary Assistance for Needy Families (TANF) that:

- Replaces former entitlement programs with Federal block grants
- Devolves authority and responsibility for welfare programs from Federal to State government
- Emphasizes moving from welfare to work through time limits and work requirements

### Changes eligibility standards for Supplemental Security Income (SSI) child disability benefits

- Restricts certain formerly eligible children from receiving benefits
- Changes eligibility rules for new applicants and eligibility redetermination

### Requires States to enforce a strong child support program for collection of child support payments

### Restricts aliens' eligibility for welfare and other public benefits

- Denies illegal aliens most public benefits, except emergency medical services
- Restricts most legal aliens from receiving food stamps and SSI benefits until they become citizens or work for at least 10 years

- Allows States the option of providing Federal cash assistance to legal aliens already in the country
- Restricts most new legal aliens from receiving Federal cash assistance for 5 years
- Allows States the option of using State funds to provide cash assistance to nonqualifying aliens

### Provides resources for foster care data systems and a Federal child welfare study

### Establishes a block grant to States to provide child care for working parents

### Alters eligibility criteria and benefits for child nutrition programs

- Modifies reimbursement rates
- Makes families (including aliens) that are eligible for free public education also eligible for school meal benefits

### Tightens national standards for food stamps and commodity distribution

- Institutes an across-the-board reduction in benefits
- Caps standard deduction at fiscal year 1995 level
- Limits receipt of benefits to 3 months in every 3 years by childless able-bodied adults age 18-50 unless working or in training

## Welfare Law Changes Dramatically

The Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) fundamentally changed the public assistance system established during the 1930s. The Act replaced the entitlement program Aid to Families with Dependent Children (AFDC) with Temporary Assistance for Needy Families (TANF), which is funded through block grants to States. TANF provides assistance and work opportunities to needy families by granting States the Federal funds and wide flexibility to develop and implement their own welfare programs. It seeks to move people from welfare to work by imposing a 5-year lifetime limit on receiving Federal welfare benefits and requiring recipients to work or seek employment within 2 years of receiving benefits. Low-income single

mothers and their families are the primary recipients of TANF.

### The Rural Context

During the 1990s, the U.S. economy enjoyed an unprecedented period of economic growth, as unemployment rates fell to 30-year lows and employment continued to expand in both rural and urban areas. Yet, some areas within rural America benefit when the Nation's economy is strong while others do not. For example, about 364 nonmetro U.S. counties, 16 percent of all nonmetro counties, had poverty rates of 20 percent or higher consistently over the last four decades. These counties contain almost a quarter of the rural poor and have a disproportionate number of economically at-risk residents. At the same time, their local economies are weaker and do not generate jobs as well as other nonmetro counties. The inherent disadvan-

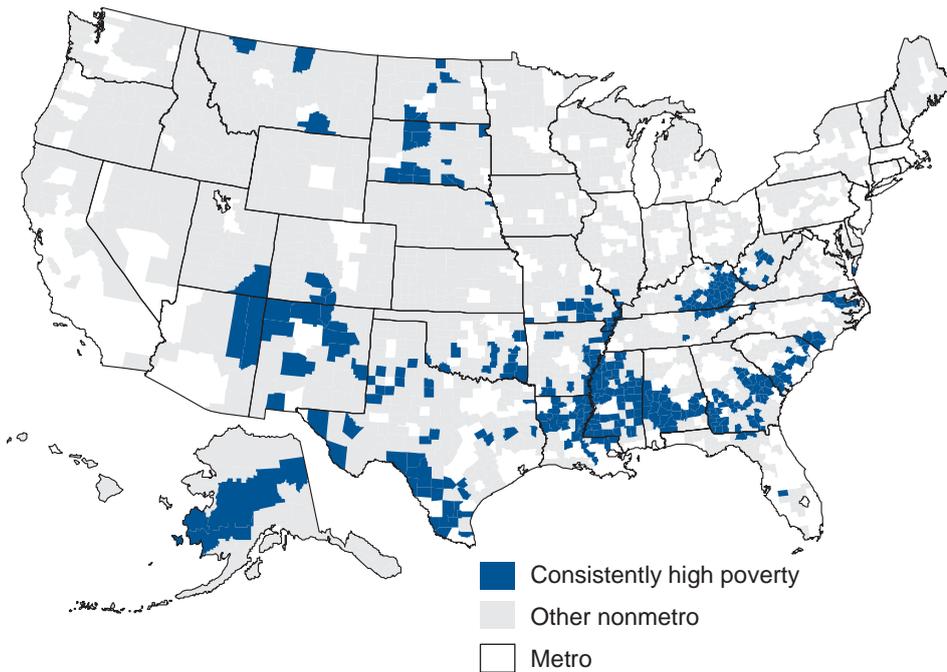
tages of these counties may be an obstacle to welfare reform efforts.

Also, some remote rural areas are characterized by conditions that may impede the move from welfare to work, irrespective of population characteristics or the health of the local economy. Low population densities in these remote rural areas often mean greater distances to jobs and increased demands for reliable transportation, inaccessibility of key social and educational services, and fewer child care options. To the extent that rural and urban areas differ in their composition, local labor markets, and support services, welfare policy outcomes may vary.

### Lessons Learned

Results from recent national and State-level studies of rural welfare reform are mixed. At the national level, welfare reform outcomes did not differ greatly

**Nonmetro counties with consistently high poverty rates contain nearly one-fourth of the rural poor, 1960-2000**



Note: Consistently high poverty counties are those with poverty rates of 20 percent or more in each decade, 1960-2000.

Source: Prepared by ERS based on data from the Bureau of Census.

between rural and urban areas, and policy-makers might conclude that welfare reform was successful in all areas of the Nation. However, rural areas are diverse and national-level analyses that use a simple rural-urban dichotomy can mask rural variation in welfare program operation, structure of opportunities, and program outcomes revealed by a closer look at individual State and local welfare reform efforts. When national-level findings are disaggregated by State and by rural and urban areas within States, a less positive picture emerges for some rural places, particularly the poorest and most remote rural areas.

**Has welfare dependency declined as a result of welfare reform?** At the national level, TANF caseloads fell by almost half between 1994 and 1999. On average, caseload declines were about as large in rural areas as in urban areas, but some States

had very different patterns of change in rural and urban caseloads. In Mississippi, TANF declines were smaller in rural areas than in urban areas after accounting for differences in local conditions and population characteristics that could have affected caseload declines. Study findings suggest that the most isolated and remote rural areas of Mississippi, with smaller employment growth and fewer support services, had the most difficulty in reducing welfare caseloads. Studies in South Carolina, Oregon, and Kentucky also found smaller rural than urban caseload declines. These interstate differences in rural and urban outcomes are likely due to variations in State welfare program implementation, structure of job opportunities, and work support services.

**Can rural welfare recipients find work?** National studies suggest that a strong economy, welfare reform, and

expansion of the Earned Income Tax Credit (EITC) have helped raise the employment rates of single mothers, with one-half to two-thirds finding employment at some time after leaving the welfare rolls. The proportion of poor single rural mothers who were employed rose sharply after welfare reform, increasing from 59 percent in 1996 to 70 percent in 1999. Although the increase was similar in both rural and urban areas, some State-level studies suggest more variable effects. The strongest evidence comes from a Minnesota study by the Manpower Demonstration Research Corporation (MDRC) that examined the employment and earnings gains of a control group of single-parent (predominantly mothers) AFDC participants and a group of similar participants in an experimental welfare reform program, the Minnesota Family Investment Program (MFIP). Welfare recipients were randomly assigned to the two groups, so that any changes in employment and earnings during the 2-year study could be attributed to the experimental program rather than the characteristics of recipients. Employment for single parents increased in both urban and rural counties. In contrast to the large and lasting employment increases in urban counties, however, increases in rural counties were much smaller and program effects on rural employment faded considerably by the second year of the study.

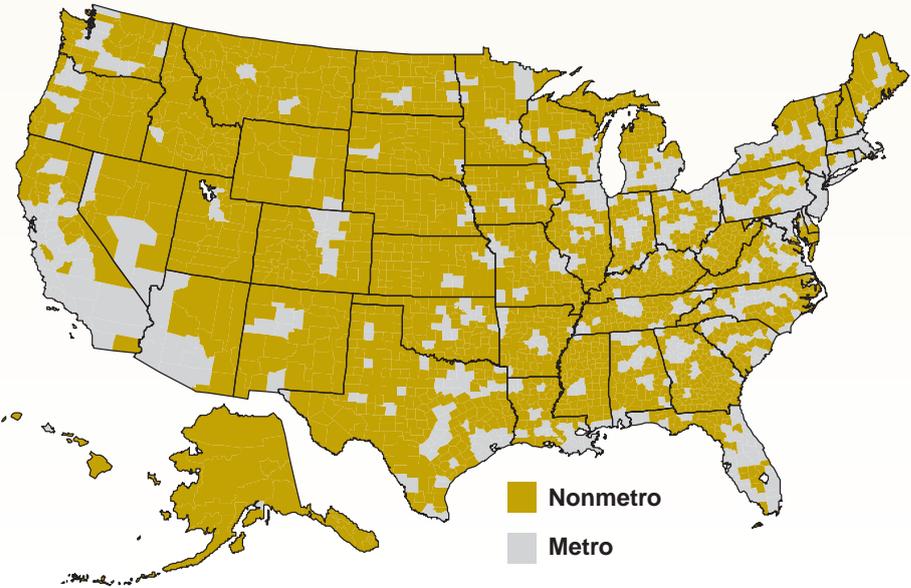


Photo by Ken Hammond, USDA

## Defining Rural Areas

Policy discussions about conditions in rural America often refer to “nonmetropolitan areas.” Metropolitan areas, as defined by the Office of Management and Budget, include core counties with one or more central cities of at least 50,000 residents or with an urbanized area of 50,000 or more and total area population of at least 100,000. Fringe counties (suburbs) that are economically tied to the core counties are also included in metropolitan areas. Nonmetropolitan (nonmetro) counties are outside the boundaries of metropolitan areas and have no cities with 50,000 residents or more. The terms “nonmetro” and “rural” are used interchangeably in this article.

Metro and nonmetro counties in the United States



**Did welfare reform improve economic status?** Real annual earnings for poor rural mothers increased from \$3,835 in 1989 to \$6,131 in 1999. Income increased even more when adjusted for the earned income tax credit (EITC), which provides a refundable tax credit to low-income workers. In some States, however, the effects of welfare reform on earnings were smaller for rural than urban areas. The MDRC study in Minnesota found that the experimental welfare reform program had no longstanding effect on the average earnings of rural welfare recipients, although it increased the average earnings of urban recipients. Differences in demographic characteristics of recipients, work experience, attitudes about welfare and work, and local economies explain some of the differences in rural-urban average earnings.

Welfare reform’s emphasis on work experience over additional education and training means that welfare recipients’ best chance to increase their earnings is to learn skills in entry-level jobs and eventually leverage these new skills for better pay or higher positions. However, many low-skill, entry-level jobs are “dead-end” jobs,

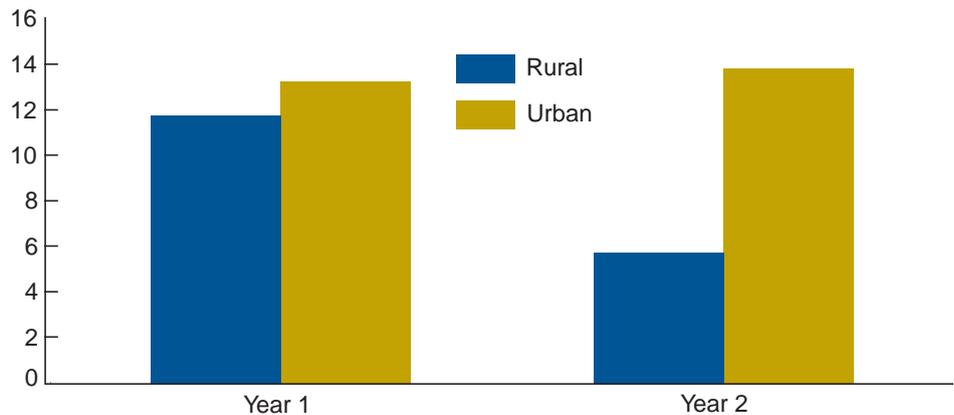
providing almost no new skills and offering limited prospects for upward mobility.

Former welfare recipients are typically tracked into such jobs both because their limited skills match the job requirements and because many of these jobs have been traditionally considered “women’s work.” Moreover, even among former welfare recipients with relatively good prospects

for career mobility, only a small percentage move ahead each year, while others may lose their jobs and be forced to take dead-end jobs. Thus, while some recipients may see substantial wage increases after the initial job, many others will need to acquire skills through formal education and training to command wages that lead to economic independence.

### Welfare reform's boost to rural employment subsided in the Minnesota program's second year

Percentage point difference in average quarterly employment of participants



Note: Figure shows difference in percent employed between control group of AFDC recipients and MFIP recipients.

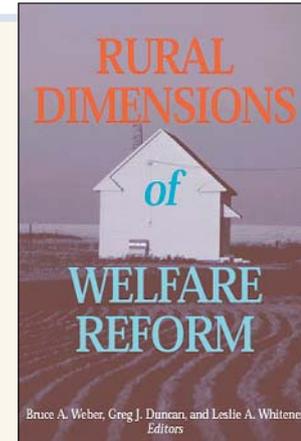
Source: Gennetian, Lisa, Cindy Redcross, and Cynthia Miller, “Rural-Urban Differences in the Minnesota Family Investment Program (MFIP),” in Weber, B., G. Duncan, and L. Whitener (eds.), *Rural Dimensions of Welfare Reform*, W.E. Upjohn Institute for Employment Research, 2002.

**How does welfare reform affect rural labor markets?** While rural welfare recipients have an immediate need to find employment, their entry into the labor force can have a longer term effect on local employment and earnings levels. The increase in labor supply associated with welfare recipients' entry into the workforce, for example, could decrease wages not only for former recipients but also for others competing for the same limited-skill types of jobs. The size of this effect will depend on how the demand for labor responds to changes in wages. If small wage declines stimulate the creation of more jobs, then the impact of welfare reform on wages should be small. If job creation is sluggish, however, then larger declines in wages will be needed to match the demand for labor with the increased labor supply.

Because welfare reform has been in place for less than a decade, data on its effects on the labor market are limited. Earlier studies of the aggregate labor market suggest that effects will be small because welfare recipients constitute a small share of the labor supply.

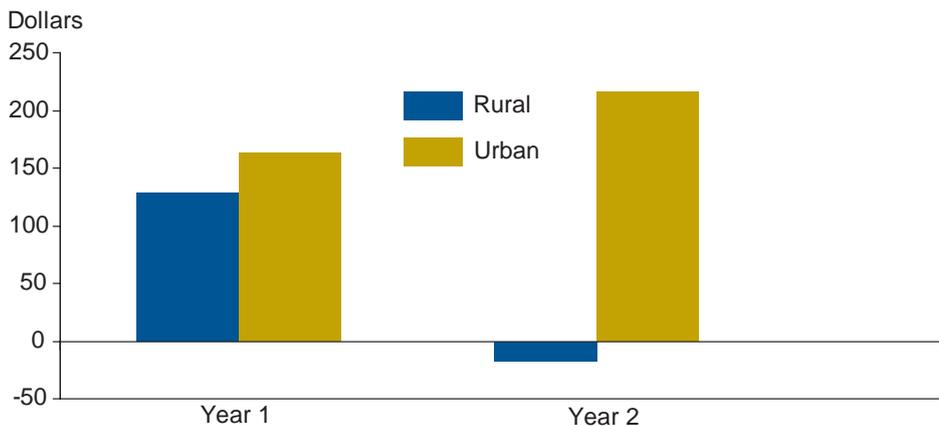
Preliminary results of an ERS study, however, suggest that increased workforce participation associated with caseload declines in the late 1990s may have depressed the wages of low-skill workers by 2 or 3 percent, with the effects concentrated in places with the greatest caseload decline. With former welfare recipients joining the labor force, unemployment rates may also rise, at least temporarily, especially in places where welfare leavers have difficulty finding and holding jobs. This issue may present a greater challenge for rural areas during an economic downturn than in a period of robust economic growth.

**Is the welfare-to-work transition more difficult in some rural areas?** Although rural areas have become more culturally, politically, and economically integrated with urban areas, some State-level analyses suggest that rural areas lag urban areas in ease of welfare-to-work transition. In particular, welfare-to-work transitions were harder in rural areas characterized by consistently high-poverty and remote locations. In Mississippi, labor market areas far removed from urban centers



In May 2000, the Economic Research Service, the Joint Center for Poverty Research, and the Rural Policy Research Institute co-sponsored a conference, with funding from ERS' Food Assistance and Nutrition Research Program, that offered the first comprehensive look at the effects of welfare reform in rural areas. Findings from this conference are reported in *Rural Dimensions of Welfare Reform*, published by the W.E. Upjohn Institute for Employment Research in June 2002. This effort represents the first comprehensive assessment of the effects of welfare reform in rural America. It forms the basis for this article and contains further details on research methods and findings. For more information, see [www.ers.usda.gov/Emphases/Rural](http://www.ers.usda.gov/Emphases/Rural)

**Welfare reform effects on rural recipients' earnings faded by the second year of the Minnesota study**



Note: Figure shows difference in quarterly earnings received by control group of AFDC recipients and MFIP participants.

Source: Gennetian, Lisa, Cindy Redcross, and Cynthia Miller, "Rural-Urban Differences in the Minnesota Family Investment Program (MFIP), in Weber, B., G. Duncan, and L. Whitener (eds.), *Rural Dimensions of Welfare Reform*, W.E. Upjohn Institute for Employment Research, 2002.

were found to be less likely to create jobs matching the education level of TANF recipients. These areas are doubly disadvantaged because most include persistently high-poverty counties. Such remote areas have the poorest outlook for growth in unskilled jobs, such as low-paying service or retail jobs, the most likely employment available for welfare recipients. These labor markets also had the weakest network of licensed child care facilities and were least accessible by existing public transportation, factors which also work against the welfare-to-work transition.

According to a study of welfare families and community residents in seven

Iowa communities, welfare reform effects hinge on differences in the proximity of jobs and access to social support services. Urban centers offer more job opportunities and support a wider range of social services than rural communities. Welfare recipients who live in or adjacent to urban areas have access to more and higher paying jobs than those who live in remote rural communities. Welfare recipients seeking jobs require access to reliable, affordable transportation, but cost-effective mass transit systems are less likely to exist in more sparsely settled rural areas. Support services, including job training or health care, are also less available in smaller, more rural areas.

### Next Steps

The overall effects of welfare reform on caseloads, employment, and poverty have been positive throughout the country. Some rural areas have done quite well in meeting the goals of welfare reform by reducing caseloads and improving the economic self-sufficiency of former welfare recipients. Yet, several studies of State welfare programs and specific policy provisions point to fewer welfare reform successes in rural than in urban areas of their States. These differences are due in part to variations in State welfare programs, including the amounts and types of assets used to determine eligibility, the time period for work requirements, and the design of child care and transportation assistance programs, which may function differently in rural than in urban parts of the State. At the same time, the diverse nature of rural areas makes welfare recipients in some areas harder to serve than in others, particularly in consistently high-poverty counties and the most remote rural areas with fewer employment opportunities and work support services.

As TANF caseloads fell sharply during the 1990s, most welfare recipients gained at least a temporary foothold in the labor



USDA photo

market. However, many former welfare families remained poor, and not all received the work-based supports they needed to gain permanent economic independence. Furthermore, the effects of the current recession that began in March 2001 are now being felt, as national TANF caseloads began to rise during the last quarter of 2002.

As Congress considers reauthorization of PRWORA in 2003, the policy debate will focus on a variety of critical issues, including funding levels, work requirements, time limits and sanctions, child care, and the adequacy of provisions during economic downturns. Of particular importance are welfare reforms that address or recognize specific rural issues, including less favorable job opportunities and higher unemployment in rural than in urban areas; limited transportation; service delivery problems; and lack of affordable, flexible, and quality child care. Greater flexibility on time limits and work requirements as well as increased efforts to create additional job opportunities could greatly ease the welfare-to-work transition of rural welfare recipients, particularly in the most poor and remote rural areas. Future wel-

fare reforms that recognize the diversity in context, resources, and opportunities in rural places will offer the most effective strategies to move welfare recipients from welfare to self-sufficiency.  $\mathcal{W}$

### This article is drawn from...

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Hamrick, Karen (ed). *Rural America at a Glance*, RDRR No. 94-1, USDA/ERS, September 2002, available at: [www.ers.usda.gov/publications/rdr94-1](http://www.ers.usda.gov/publications/rdr94-1)

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A WINDOW INTO THE PAST. . .

# FRANCIS JOSEPH MARSCHNER

## USDA GEOGRAPHER



These days we are used to seeing land use imagery from space, with computers receiving and collating billions of bits of data from satellites in a single pass over the continent. Francis Marschner, a USDA geographer in both the Bureau of

Agricultural Economics (BAE) and Economic Research Service, went about it the hard way in the 1920s and 1930s. By painstakingly consulting survey field notes, aerial photographs, and statistical compilations, he fashioned continental scale maps of land use. This pioneering work established the interdisciplinary approach to land use research in BAE and ERS that informed conservation and land development programs at the Federal and State level, and expanded cartographic methods for depicting economic and physical data.

Born in Austria in 1882, Marschner studied at the Cartographic Institute in Berlin, before immigrating to the United States in 1915. His work at USDA began with the *Atlas of American Agriculture*, published between 1922 and 1936. In 1945, he began work on *Major Land Uses in the United States*, published in 1950, which contained the first authoritative medium-scale U.S. land use map, printed in the *National Atlas*

Using survey field notes, aerial photographs, and statistical compilations, Francis Marschner created the first authoritative medium-scale U.S. land use map in 1950. This version of the map, published in 1958, depicts twelve categories of land use, ranging from cropland and pastureland to desert and marshland. The heir to Marschner's work at ERS is the *Major Uses of Land in the United States, 1997*, available at [www.ers.usda.gov/publications/sb973](http://www.ers.usda.gov/publications/sb973)

of the United States. The *Major Land Uses* series has been published every 5 years ever since, and is still the only comprehensive picture of all land uses for the U.S. prepared by the Federal government. The Association of American

Geographers awarded this work its citation for meritorious work, the hallmark of Marschner's career.

Another major work was *Land Use Patterns in the United States*, a collection of 168 aerial photographs depicting the variety of landforms across America. Marschner received USDA's Superior Accomplishment Award in 1947, and in 1963 was elected a fellow of the American Association for the Advancement of Science.

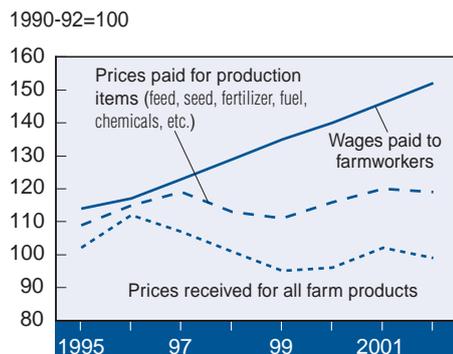
Marschner retired from USDA's BAE in 1952, but continued to work under a special unpaid joint appointment in ERS and USDA's Agricultural Research Service, walking nearly 7 miles to work each day. Marschner never married and had no relatives in the country, but, according to the *Annals of the Association of American Geographers*, he had "the devotion of his 'family' of friends in the Department of Agriculture." He died on January 31, 1966, walking to work at age 83.

Farm, Rural, and Natural Resources Indicators									
	1990	1995	2000	2001	2002	2003	Annual percent change		
							1990-2000	2001-02	2002-03
Cash receipts (\$ billion)	169.5	188.0	193.7	202.8	193.5f	200.5f	1.3	-4.6	3.6
Crops	80.3	100.8	94.1	96.4	97.6f	101.6f	1.6	1.3	4.0
Livestock	89.2	87.2	99.6	106.4	95.9f	98.9f	1.1	-9.9	3.2
Direct government payments (\$ billion)	9.3	7.3	22.9	20.7	13.1f	17.6f	9.4	-36.6	33.7
Gross cash income (\$ billion)	186.9	205.9	230.4	238.5	222.5f	234.9f	2.1	-6.7	5.6
Net cash income (\$ billion)	52.7	52.5	58.4	59.7	46.3f	51.3f	1.0	-22.5	11.0
Net value added (\$ billion)	80.8	74.8	92.1	90.9	76.5f	90.8f	1.3	-15.9	18.7
Farm equity (\$ billion)	702.6	815.0	1,022.3	1,059.0	1,086.6f	1,099.7f	3.8	2.6	1.2
Farm debt-asset ratio	16.4	15.6	15.3	15.4	15.7f	16.0f	-0.7	1.7	2.2
Farm household income (\$/farm household)	38,237	44,392	61,947	64,117p	62,515p	65,095f	4.9	-2.5	4.1
Farm household income as a percentage of U.S. household income (%)	103.1	98.8	108.6	110.2p	na	na	0.5	na	na
Nonmetro-Metro difference in poverty rates (% pts.)	3.6	2.2	2.6	3.1	na	na	-3.2	na	na
Cropland harvested (million acres)	310	302	314	311	307p	na	0.1	-1.3	na
USDA Conservation Program Expenditures (\$ bil.) <sup>1</sup>	3.0	3.5	3.4	3.7	3.5q	na	1.3	-5.4	na

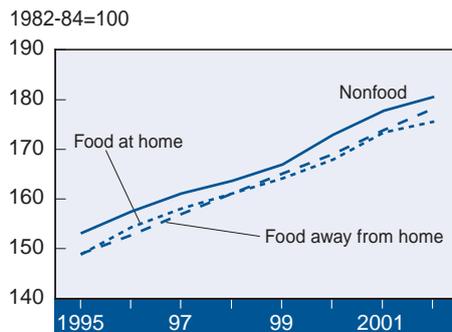
Food and Fiber Sector Indicators									
U.S. gross domestic product (\$ billion current)	5,803	7,401	9,825	10,082	10,446	10,843f <sup>2</sup>	5.4	3.6	3.8
Food and fiber share (%)	15.1	14.2	12.6	12.3	na	na	-1.8	na	na
Farm sector share (%)	1.4	1.0	0.8	0.8	0.8	na	-5.4	0.0	na
Total agricultural imports (\$ billion) <sup>1</sup>	22.7	29.8	38.9	39.0	41.0	46.0	5.5	5.1	12.2
Total agricultural exports (\$ billion) <sup>1</sup>	40.3	54.6	50.7	52.7	53.3	56.0	2.3	1.1	5.1
CPI for food (1982-84=100)	132.4	148.4	167.8	173.1	176.2	179.0f	2.4	1.8	1.6
Personal expenditures on food as a percentage of disposable income (%)	11.2	10.6	10.2	10.2	10.1	na	-0.9	-1.0	na
Share of total food expenditures for at-home consumption (%)	55.4	53.9	53.3	53.8	53.9	na	-0.4	-0.2	na
Farm-to-retail price spread (1982-84=100)	144.5	174.5	210.3	215.4	221.2	na	3.8	2.7	na
Total USDA food and nutrition assistance spending (\$ billion) <sup>1</sup>	24.9	37.9	32.6	34.2	38.0	na	2.7	11.1	na

f = Forecast. p = Preliminary. q = 2002 Administration request. na = Not available.  
<sup>1</sup> Based on October-September fiscal years ending with year indicated.  
<sup>2</sup> Forecast for 2003 based on March 2003 forecasts from the Office of Management and Budget.

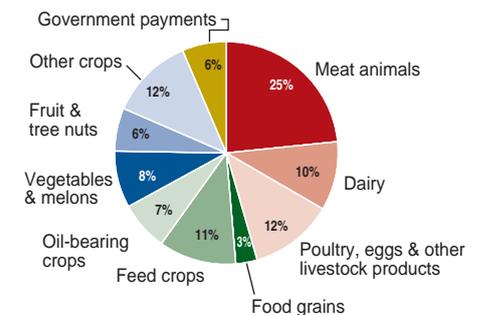
**Prices paid and received by farmers**



**Consumer price indexes for food and nonfood items**



**Cash receipts from farming in 2002**



For more information, see [www.ers.usda.gov/AmberWaves](http://www.ers.usda.gov/AmberWaves)

Behind the Data

Growth in Postwar Agriculture: The Key Role of Productivity

Growth in agricultural output results from increased use of one or more inputs (capital, land, labor, and materials) and from growth in productivity, which reflects investments in research and development, extension, education, and infrastructure. Each input's contribution to output growth equals the product of the input's growth rate and its respective share of total production cost.

The output of U.S. agriculture grew 1.78 percent per year on average from 1948 to 1999. Increasing productivity accounted for 94 percent of growth in agricultural output, compared with 32 percent in the rest of the economy.

The singularly important role of productivity growth in agriculture is made all the more remarkable by the contraction in labor input. Over the full 1948-99 period, labor input declined 2.4 percent per year, on average. When weighted by its 0.25 share of total cost, the contraction in labor input contributed -0.61 percentage point per year on average to agricultural output growth.

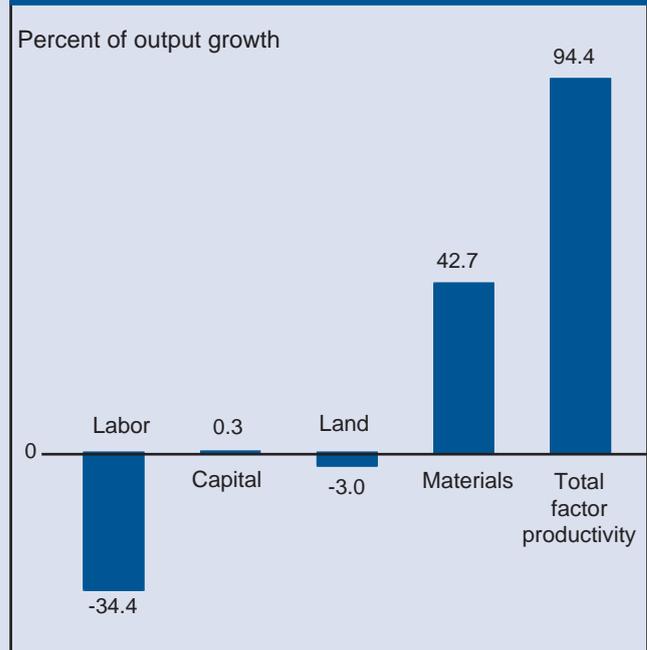
Land's contribution to growth in agricultural output was also negative, reflecting substitution of capital and materials for land. Over 1948-99, land contributed -0.05 percentage point per year to the sector's output growth.

Capital's contribution to agricultural output was generally positive, but small, averaging only a fraction of a percent. Material inputs, such as fertilizers, pesticides, and seeds, contributed a positive rate, averaging 0.76 percentage point per year to growth of output, enough to outweigh the negative contributions of labor and land.

When the net contributions of all four quantifiable inputs to agricultural output growth are accounted for over 1948-99, they explain only about one-tenth of 1 percentage point—less than 6 percent—of the average annual rate of growth. Even after accounting for changes in quality of the inputs—like the increased technology embedded in material inputs, the greater sophistication of capital inputs, and the greater skill and education embodied in people working on farms—changes in productivity alone emerge as the key component responsible for agricultural output growth.

Eldon Ball, [eball@ers.usda.gov](mailto:eball@ers.usda.gov)

Productivity growth was the single largest contributor to output growth in the U.S. farm sector, 1948-99



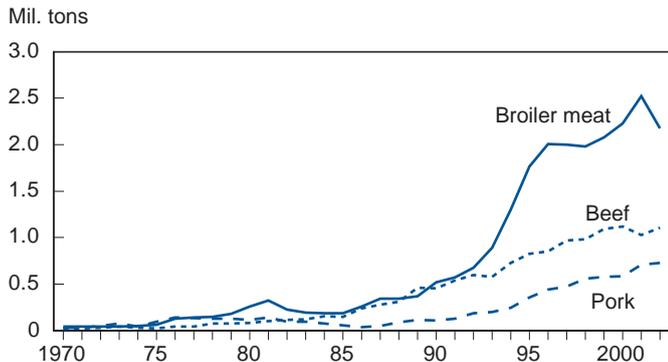
Sources of output growth in the U.S. farm sector

Sources of growth	1948-53	1953-57	1957-60	1960-66	1966-69	1969-73	1973-79	1979-89	1989-99	Overall, 1948-99
<i>Weighted percentage point contribution to total output growth</i>										
Labor	-1.11	-1.01	-0.72	-1.05	-1.01	-0.27	-0.69	-0.40	-0.09	<b>-0.61</b>
Capital	0.58	0.16	0.06	0.11	0.37	0.15	0.36	-0.56	-0.24	<b>0.01</b>
Land	0.02	-0.09	-0.08	-0.03	-0.09	-0.17	0.00	-0.05	-0.05	<b>-0.05</b>
Materials	1.54	1.44	1.56	0.90	0.34	0.96	1.39	-0.76	0.96	<b>0.76</b>
Total factor productivity	0.04	0.53	3.30	1.32	2.58	2.03	1.21	2.71	1.54	<b>1.68</b>
<i>Growth rate (percent)</i>										
Total output growth	1.07	1.02	4.13	1.24	2.20	2.70	2.26	0.93	2.12	<b>1.78</b>

Source: ERS website on agricultural productivity at [www.ers.usda.gov/data/agproductivity](http://www.ers.usda.gov/data/agproductivity)

Markets and Trade

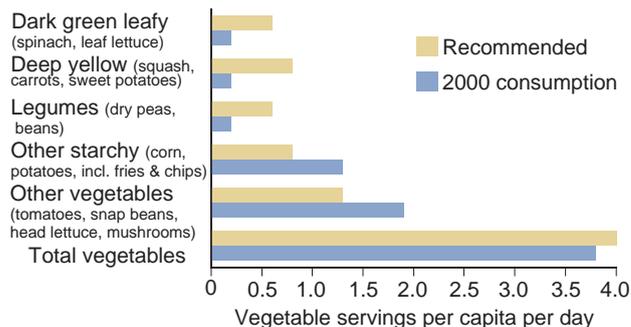
U.S. meat exports have grown dramatically since the 1980s, especially broiler meat exports



Source: Compiled from data provided by USDA's Foreign Agricultural Service.

Diet and Health

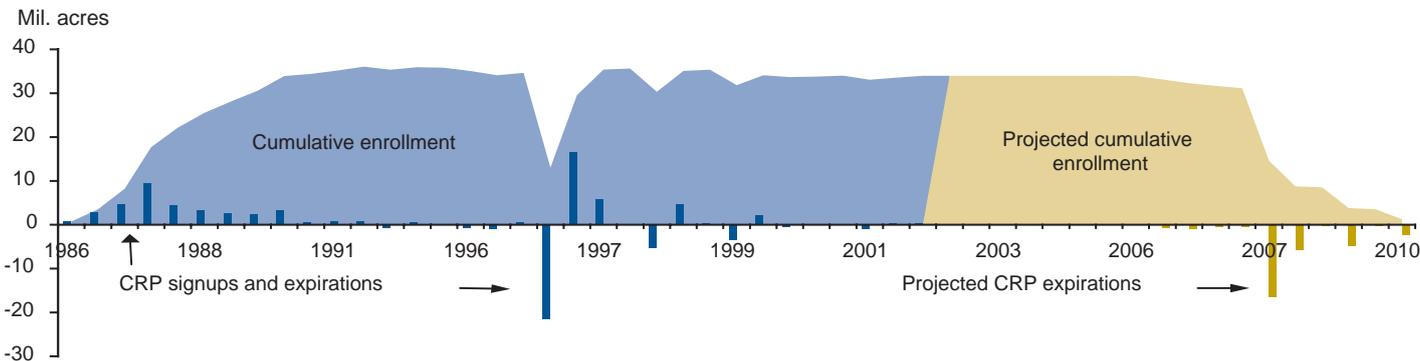
Consumption of dark-green leafy and deep-yellow vegetables and legumes falls short of USDA Food Guide Pyramid recommendations



Consumption estimates based on food supply for domestic use.

Natural Resources and Environment

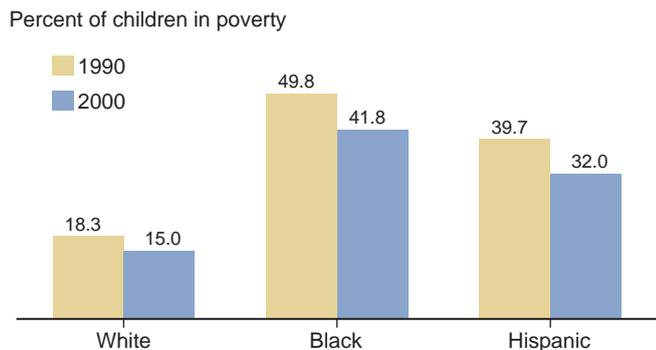
Enrollment in the Conservation Reserve Program (CRP) will likely continue at around 34 million acres until 2006, then begin falling unless the program is extended\*



\* Not including 2.8 million acres newly authorized in the 2002 Farm Act. Source: Farm Service Agency data, USDA.

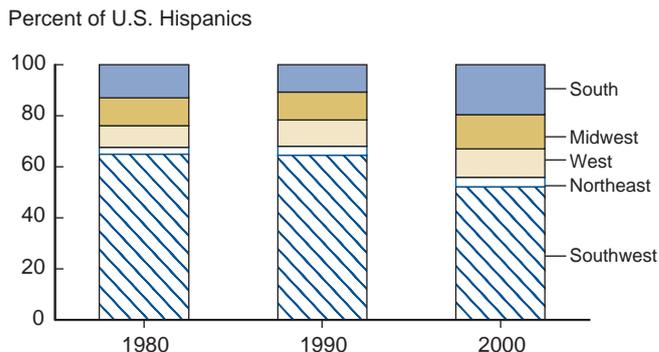
Rural America

Nonmetro child poverty rates declined between 1990 and 2000 for all racial/ethnic groups



Source: Calculated by ERS from the 1990 and 2000 Census.

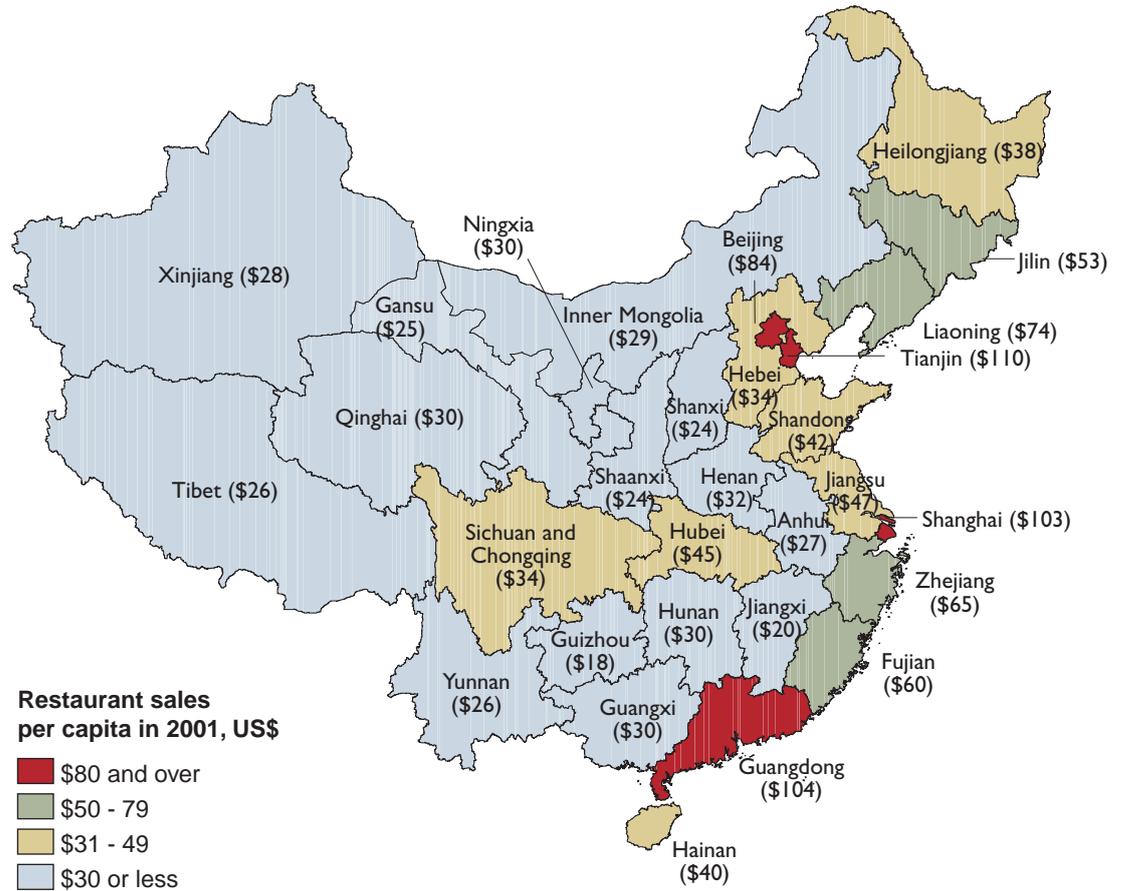
While the majority of U.S. Hispanics still reside in the Southwest, other U.S. regions have gained proportionately



Source: U.S. Census Bureau.

**On the Map**

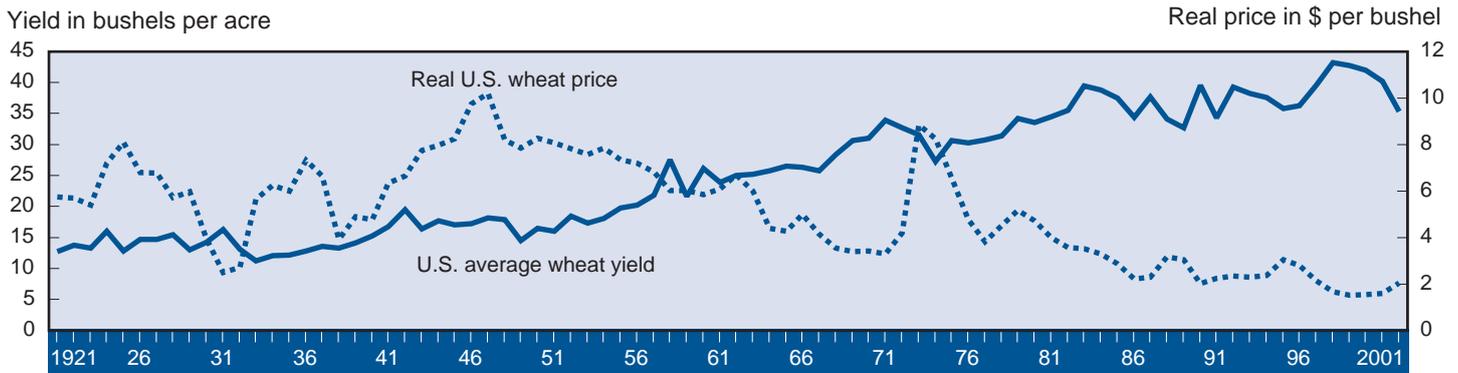
Restaurants are booming in China, with sales rising an average of 16.5 percent annually from 1996 to 2001, about double the rate of growth in all retail sales. Per capita restaurant sales were highest—over \$100—in some of China's richest regions along the coast—Guangdong Province and the Shanghai and Tianjin municipalities—where 2001 per capita urban incomes ranged from \$1,000 to \$1,500 per year. In contrast, per capita restaurant sales were between \$20 and \$30 in most of China's central and western provinces, which have lower urban per capita incomes ranging from \$650 to \$850. Most residents of central and western provinces live in rural areas where incomes are even lower and restaurants are less common.



Source: *China Statistical Yearbook 2002*, published by China National Bureau of Statistics.

**In the Long Run**

The real U.S. price of wheat has been trending downward since the late 1940s, while U.S. wheat yields have been rising due to improved varieties and cultivation practices. The declining real price reflects global supply increasing more rapidly than global demand despite income and population growth around the world.



Real wheat prices were estimated by deflating nominal prices by the Consumer Price Index. Source: Consumer Price Index comes from Haver Analytics and Bureau of Labor Statistics.

# Current Activities

## Land Use Change

ERS economist **Ruben Lubowski** ([rlubowski@ers.usda.gov](mailto:rlubowski@ers.usda.gov)) recently delivered an address on "Determinants of Land-Use Change in the United States, 1982-1997" at the Yale School of Forestry and Environmental Studies in New Haven, CT, as part of an interdisciplinary lecture series sponsored by the Hixon Center for Urban Ecology. The series provides different perspectives on policies aimed at environmentally sustainable land development. Lubowski discussed the relative importance of different land-use determinants for the U.S. based on his econometric analysis of data from USDA's National Resources Inventory (NRI).

## Exemptions to Methyl Bromide Ban

ERS researchers **Craig Osteen** ([costeen@ers.usda.gov](mailto:costeen@ers.usda.gov)), **Carmen Sandretto**, and **Margriet Caswell** met with the Environmental Protection Agency (EPA) Methyl Bromide Critical Use Exemption [CUE] Economics Review Team recently to discuss improvements in the CUE application

form and review process. Exemptions can be made if there are no economically feasible alternatives to the use of methyl bromide. In deciding which applications to put forward to the parties of the Montreal Protocol, the U.S. can consider whether the lack of methyl bromide for a particular use would cause significant market disruption (see article in April 2003 *Amber Waves*). The ERS economists helped EPA review the first application for an exemption to the methyl bromide restriction last year. Applications from the first round of petitions are currently under consideration by the international Methyl Bromide Options Committee. The next round is due in August.

## Tracking the History of Food Products

Traceability systems track the flow of food products through the supply chain. Such systems could be used to manage issues like bio-terrorism, country-of-origin labeling, Mad Cow disease, and genetically engineered foods. Is mandatory traceability a useful and appropriate policy choice? The

answer partially depends on whether firms will voluntarily supply traceability data. ERS researchers are examining the rationale for and extent of tracing in the U.S. food chain and assessing where mandatory traceability may be desirable. **Barry Krissoff**, [barryk@ers.usda.gov](mailto:barryk@ers.usda.gov)

## Gauging Farmers' Responses to New Farm Programs

The 2002 Farm Act introduced counter-cyclical payments, a new type of program that supports farm revenue for eight major field crops when prices are low. Unlike traditional price supports, payments are based on historical acreage and yields and not current production. ERS researchers are looking to see if counter-cyclical payments influence farmers' planting and production decisions and, if so, how and to what extent? Because counter-cyclical payments interact with other elements of agricultural programs, like direct payments, marketing loan benefits, and crop insurance, ERS is investigating these interactions as well. **Ed Young**, [ceyoung@ers.usda.gov](mailto:ceyoung@ers.usda.gov)

# New Releases

## Feeding Children When School Is Out

Through the Summer Food Service Program, USDA funds meals for children in low-income areas when school is not in session. In July 2001, 2.1 million children participated in this program, about 14 percent of the number who received free or reduced-price school meals during the previous school year. The ERS report *Feeding Low-Income Children When School Is Out: The Summer Food Service Program* (FANRR-30) presents findings from the first comprehensive study of this program in more than a decade. The report describes how the program operates at all levels of administration, examines factors that affect participation by sponsors and chil-

dren, and measures the nutritional quality of meals served and the extent of plate waste. **Jane Allshouse**, [allshous@ers.usda.gov](mailto:allshous@ers.usda.gov)

## Fruit and Vegetable Snacks in Schools

The 2002 Farm Bill provided \$6 million for the Fruit and Vegetable Pilot Program, which offered free fruit and vegetable snacks to children in 107 elementary and secondary schools in Indiana, Iowa, Michigan, New Mexico, and Ohio during the 2002-03 school year. A new ERS report, *Evaluation of the USDA Fruit and Vegetable Pilot Program: Report to Congress* (E-FAN-03-006), shows that the pilot was popular among most students, parents, State representatives, teachers, principals, and foodservice staff. The report also includes types of fruits and vegetables offered to children and strategies for delivery. **Jean Buzby**, [jbuzby@ers.usda.gov](mailto:jbuzby@ers.usda.gov)

## Organic Farming Expands

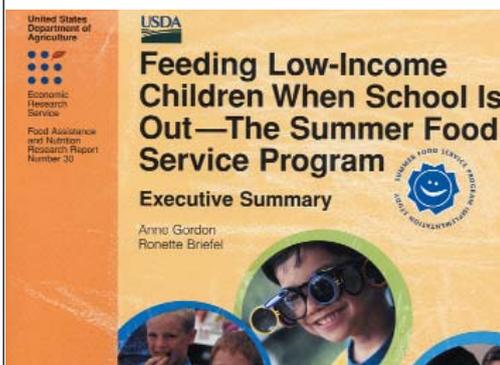
The rapid expansion of U.S. farmland managed under organic systems in the 1990s is documented in *U.S. Organic Farming in 2000-2001: Adoption of Certified Systems* (AIB-780). The uniform standards for organic production and processing adopted by USDA in October 2002 are expected to facilitate



further growth in the organic farm sector. This report updates USDA estimates of land farmed with organic practices for 2000 and 2001 and provides new estimates on the number of certified organic operations in each State. **Catherine Greene**, [cgreene@ers.usda.gov](mailto:cgreene@ers.usda.gov)

## Commodity Markets and Trade

ERS Outlook reports provide timely analysis of major commodity markets and trade, including special reports on hot topics. All reports are available electronically and can be found at [www.ers.usda.gov/publications/outlook](http://www.ers.usda.gov/publications/outlook) along with a calendar of future releases. **Joy Harwood**, [jharwood@ers.usda.gov](mailto:jharwood@ers.usda.gov)



# Recent Meetings

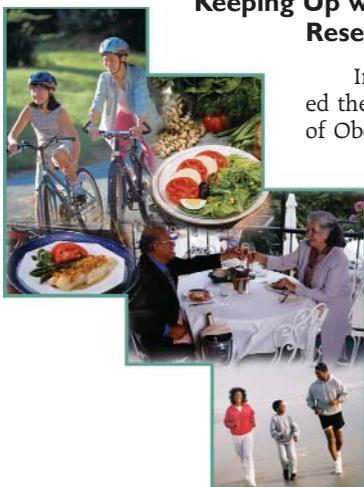
## Uses of Retail Scanner Data

In June 2003, ERS hosted the workshop "Use of Scanner Data in Policy Analysis." As markets become more segmented and contracts replace spot transactions, market operations become less transparent, and the declining volume of available data associated with those transactions become less representative and therefore less useful for research. As a result, researchers are increasingly turning to retail scanner data to decipher market workings. Not only are such data plentiful (although expensive), but, with links to demographics of individual households, the data also provide a window on distributional issues. The workshop provided a forum in which experts discussed unique ways that scanner data permit researchers to address today's food policy issues. The voluminous quantity of the data, while an asset, can make working with the data difficult. Participants discussed various strategies of addressing methodological challenges in using scanner data. **David Davis**, [ddavis@ers.usda.gov](mailto:ddavis@ers.usda.gov)

## Keeping Up with Obesity Research

In April 2003, ERS hosted the workshop "Economics of Obesity," jointly organized with University of Chicago's Irving B. Harris School of Public Policy. The workshop brought together leading health economists from around the country along with researchers from ERS and other Federal agencies with the goal of reviewing the current status of economic

research on obesity and overweight and discussing areas for future research. Topics covered included the role of technological change in explaining both the long- and short-run trends in obesity, the role of maternal employment in child obesity, the impact of obesity on wages and health insurance, behavioral economics as applied to obesity, and the challenges in measuring energy intakes and physical activity. **Jay Variyam**, [jvariyam@ers.usda.gov](mailto:jvariyam@ers.usda.gov)



Digital Stock

## Agricultural Trade and Policy Reform

In June 2003, ERS cosponsored an international conference "Agricultural Policy Reform and the WTO: Where Are We Heading?" The workshop explored how changes in the global food and agricultural sector, in response to new technologies and the evolving consumer demand for food, affect the international trade environment. Related policy dimensions discussed at the workshop include agricultural policy reforms, WTO enlargement, new WTO negotiations on agriculture, and regional integration, including the enlargement of the European Union. The conference was cosponsored by the University of California, University of Calabria (Italy), and the Farm Foundation, and other institutions. **Mary Bohman**, [mbohman@ers.usda.gov](mailto:mbohman@ers.usda.gov)

## Effects of Invasive Species on U.S. Agriculture

Increased global commerce has expanded the potential for invasive pests to affect agriculture, prompting ERS to launch a research program on the economics of policies to control invasive species. To review and discuss research priorities for the extramural competitive grants program, ERS, in collaboration with the Farm Foundation, hosted a workshop on the economics of invasive plant pests and animal diseases in May 2003. More than 100 representatives from higher education institutions, USDA, other Federal and State agencies, industry, and nongovernmental organizations participated in the workshop, providing perspectives on bioeconomic risk assessment, links between trade expansion and invasive introductions, and the economics of policies to exclude, monitor, and control plant pests and animal diseases. A summary of the workshop is available at the ERS Invasive Species Management briefing room ([www.ers.usda.gov/briefing/invasivespecies](http://www.ers.usda.gov/briefing/invasivespecies)). **Utpal Vasavada**, [vasavada@ers.usda.gov](mailto:vasavada@ers.usda.gov)



See information  
on all new ERS  
releases at  
[www.ers.usda.gov/Calendar](http://www.ers.usda.gov/Calendar)

ERS celebrates the accomplishments of several researchers this month as USDA Secretary Ann Veneman recognizes the **Global Food Security Team**, the **Farm Bill Analysis Team**, and **Calvin Beale** (profiled in the premier issue of *Amber Waves* in February) for their contributions. All three received the Secretary's Honor Award, and the Global Food Security Team was designated as a Plow Award recipient. Like *Amber Waves*, these awards reflect the breadth of work covered by the Economic Research Service.

## Farm Bill Analysis Team



Dana Rayl West

*Back row (L to R):* Stephen Peterson, Paul Westcott, Richard Reeder, Jan Lewandrowski, Marvin Duncan, Andrea Cattaneo, Kevin Ingram.  
*Middle row (L to R):* Ralph Heimlich, Paul Heisey, Roger Claassen, Joy Harwood, Mary Reardon, Kelly Day-Rubenstein, Lewrene Glaser, David Hopkins, Michael Price.  
*Front row (L to R):* Anne Efland, Ronald Trostle, Adrie Custer, Ed Young, Letricia Womack, Steven Koenig, Marca Weinberg.  
*Not pictured:* Margaret Andrews, Dwight Gadsby, Daniel Hellerstein, David Johnson, Kathleen Kassel, Cassandra Klotz-Ingram

The new Farm Bill was just 9 days old when the Economic Research Service posted a unique resource on the web, comparing key provisions of old and new legislation in a side-by-side format, for each of the bill's 11 titles. In addition, this new web subsite provided preliminary economic analysis of selected provisions of the new law—the Farm Security and Rural Investment Act of 2002. Response was instantaneous, with over 52,000 hits on May 22, the day of the launch, climbing to 61,000 daily in the following week.

The relatively swift and seemingly effortless appearance of this time-saving reference on the ERS website was the work of a team of 29 analysts, writers, and editors, including a web designer, that was supported by dozens of other ERS analysts. The team's expertise spanned program areas covering commodities, trade, conservation, nutrition, rural development, and research. "Timing was everything," commented senior economist Ed Young, who directed the endeavor and wrote a large share of the content. "We wanted to make this resource available to the public as quickly as possible after the bill passed." In the months before passage of the bill, team members closely monitored its progress and

drafted early summaries and analyses. The anticipatory work, along with policy analysis ERS had developed over several years, laid the groundwork for relatively rapid completion of the Farm Bill site ([www.ers.usda.gov/Features/FarmBill](http://www.ers.usda.gov/Features/FarmBill)) once the new legislation was signed into law.

The ERS Farm Bill summary and overview included a glossary, plus links to ERS and USDA material to help put the legislation in perspective. The ERS product was a linchpin in USDA's suite of Farm Bill resources—all available on the web shortly after passage of the bill.

The ERS web pages continue to attract users searching for concise information on the Farm Bill. The Farm Bill site tallied more than 170,000 visits by the end of 2002, and over 30,000 this year. Says Ralph Heimlich, who directs policy analysis in the agency's Resource Economics Division: "This group effort is a prime example of how government agencies are harnessing web technology to improve service to large and diverse audiences."